

INSTITUTE OF TRANSPORTATION STUDIES  
University of California

(NASA-CR-152166) AN INVESTIGATION OF SHORT  
HAUL AIR TRANSPORTATION IN THE SOUTHEASTERN  
UNITED STATES (California Univ.) 202 p  
HC A10/MF A01

N78-27094

CSCL 05C

Unclass

G3/03 26238

## An Investigation of Short Haul Air Transportation in the Southeastern United States

Adib Kanafani and Huey-Shin Yuan



RESEARCH REPORT  
UCB-ITS-RR-77-6

Institute of Transportation  
Studies

Research Report  
UCB-ITS-RR-77-6

AN INVESTIGATION  
OF SHORT HAUL AIR TRANSPORTATION  
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This study was supported by a grant  
from the National Aeronautics and  
Space Administration (NASA) —  
Ames Research Center,  
under grant NSG-2127

University of California  
Berkeley, July 1977

## PREFACE

This study was conducted at the Institute of Transportation Studies, of the University of California at Berkeley. It was sponsored as part of an ongoing research program in short haul air transportation by the Ames Research Center, National Aeronautics and Space Administration (NASA).

In addition to the authors, valuable contributions to the study were made by Ms. Joan Al-Kazily, Ms. Radmila Josic, and Mr. Geoffrey Gosling. Valuable suggestions and contributions were made by the technical monitor Mr. Mark Waters of the Ames Research Center.

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## 1. FOREWARD

This report documents the results of a study of the short haul air transportation system in a region of the southeastern United States centered around Atlanta and extending 500 miles. The study represents the second stage of a continuing research on short haul air transportation that is aimed at technology assessment of short haul aircraft requirements. This report is mainly concerned with a documentation of the data acquired during this phase of the study. The data deal with demand and traffic patterns as well as service patterns in the region, with particular focus on Atlanta.

This phase of the study is not intended to draw any major findings regarding the structure of the short haul air transportation system. This would be premature, as the effort so far has been directed mainly at acquiring data and attempting to characterize the system in a manner that would permit its study in detail. Nonetheless, some preliminary findings are documented in Chapter 8. Most importantly it is found that a sizable traffic volume at Atlanta is generated by travellers from the short haul region who are connecting to other short haul flights or to long haul flights to the outside of the region. It is also found that sufficient capacity seems to exist in the region to serve the city pair travel demands. Typically less than half the travellers on a link in the system can be characterized as local traffic, the rest being travellers from outside the region. This pattern is caused, in part, by the structure of the network in which long haul flights, usually on the way to Atlanta, make stops serving the short haul cities in the region.

Plans for further study are also discussed in Chapter 8. Briefly, it is envisaged that the continuation of the research will move in the following

directions:

1. Investigation of the implications of a dedicated short haul air transportation system. This would include studying the impact on airport requirements, particularly for Atlanta; air network structure; and aircraft scheduling and fleet requirements.
2. Analysis of the demand in such a way as to predict the impact on traffic of the creation of a dedicated short haul system. This analysis would be aimed at the assessment of market potential and of the economics of such a short haul system.

## 2. INTRODUCTION

The overall objective of this study is to assess technology requirements for short haul air transportation. To that end, the study is organized in a number of steps beginning with an attempt to define and understand the structure of short haul air transportation systems. The first stage of the study was concerned with the identification of data sources in the U.S. covering the various operating aspects of short haul air transportation<sup>(1)</sup>. The second stage, which is the subject of this report, is concerned with defining the short haul air transportation system, and with characterizing its operating characteristics in a manner that would facilitate technology assessment. Recognizing the limits of generalization, and the need to look at a specific operating system, this study is conducted by looking at a specific area: the Atlanta region, defined more specifically later on in this chapter. No attempt is made to generalize the findings of the study to other regions, although some generalization can probably be made without much danger of oversimplification. The study region selected represents one of the more active short haul air transportation regions in the U.S. and one likely to have an impact on the technology assessment of short haul aircraft.

The specific objectives of this stage of the study are numerous. First, an attempt is made to characterize the travel patterns in the study region, both in terms of origin-destination patterns, and connecting and through trip patterns. Second, the structure of the air service in the region is characterized in an attempt to develop an understanding

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<sup>(1)</sup> Al-Kazily, Joan, Geoffrey Gosling, Robert Horonjeff, "Short Haul Air Passenger Data Sources in the United States," June 1976, ITS Special Report No. ITS-SR-76-1.

of the evolution of the short haul air transportation network. Finally, a look is taken at the socioeconomic environment of Atlanta and the region in order to seek an explanation for the historic evolution of short haul air travel activities and the rather high growth rates experienced in recent years. In an attempt to provide a background for the investigation of the concept of dedicated short haul service and dedicated airports, a review and assessment is made of the airport access problems in Atlanta and of the previous studies made of the feasibility of a second airport location in that metropolitan area.

In summary, the purpose of this stage of the study is to look at the short haul air transportation system in the study area, to acquire the data needed for its characterization, and to provide a general background for further studies of the system with the general aim of short haul aircraft technology assessment.

#### Conceptual Framework

As mentioned earlier, the overall objective of this study is to provide a background for short haul aircraft technology assessment. Of the main factors affecting the viability of such a technology is the economic environment. Economic and market considerations are main factors that affect the viability of such a technology. Particularly, it is necessary to assess the nature of the demand for short haul air transportation and the interaction of this demand with the supply system of air service. In order to provide sufficient information to assess alternative technologies, it is necessary to study this demand and supply interaction pattern over a range of travel distances and not to

limit the scope to a fixed trip length. Travel within a short haul region, as well as travel comprising both short and long haul air journeys are important in this regard, for it is necessary to form an idea about the necessary interface between a short haul air transportation system, and the overall air service network. Thus, emphasis needs to be placed on connecting traffic, and it is necessary to select a major hub, with a sufficient amount of short haul connections for the study. This is one reason for the selection of Atlanta and its short haul region as the study area.

Ideally, in order to assess and characterize travel demand, it is necessary to look at travellers with different trip purposes. This, however, requires that a traveler survey be conducted and adds a new dimension to data collection requirements. In this study this is not attempted and traffic volumes are looked at without consideration of trip purpose. It is safe to assume, however, that in the shorter trip lengths, say less than 200 miles, the predominant trip purpose would be business travel, and in the longer trip lengths, 200-500 miles, traffic would be split equally between business and non-business purposes.

Two types of traffic movements are looked at in order to characterize travel demands in the short haul region. The first is the origin destination pattern of all air trips between the city pairs in the region. This provides the basic information on the underlying demand for transportation in the region. Of this traffic, the origin destination patterns of the Atlanta travelers are looked at separately. The reason for this is that Atlanta is considered as the major hub in the region, and travel



demands involving Atlanta as either an origin or a destination may have an important impact on the structure of the air service network. The second type of traffic looked at is the traffic connecting at Atlanta. This is separated into two groups: connections to long haul trips and connections to other short haul trips within the study region. Connecting traffic patterns, when looked at together with origin destination patterns give an idea about the effect of the transportation network on traffic movements, and may make it possible to quantify the importance of the major hub, Atlanta, in the short haul network. In addition, connecting traffic patterns are important because of their effect on the need for a dedicated short haul airport at the hub.

Finally; a look must be taken at the supply system. Here, the service patterns and frequencies of all flights serving the study region are characterized and networks are constructed to represent the available capacity on each link.

As mentioned earlier, an objective of this research is to develop an understanding of the interaction between demand and supply in the short haul region. Having characterized demand and traffic by looking at origin destination patterns and connecting patterns, the next step is to look at the service patterns in the region. This includes all flights serving the city pairs in the regions. Important characteristics to look at include flight routings and flight frequencies. Travel times and air fares are additional attributes that become important when one looks at the competition between air and ground transportation modes in the shorter trip lengths. Ideally, one would want to look at the exact routing of all origin destination trips. However, this requires considerable data acquisition and is done to a

limited extent in this study. For the moment, the scope is limited to comparing flows of passengers and of available seats on links in the network. For some city pairs, the alternative routes available are characterized and an attempt is made to study the process of route choice. This, however, is a subject for further research during the next stage of the study.

#### Study Area and Data Sources

The study area encompasses that part of the Southeastern United States lying within 500 miles from Atlanta, Georgia. The selection of the 500 mile radius is not intended as a definition of short haul air transportation. Indeed, the definition of short haul air transportation is seen as one of the objectives of this study. Furthermore, a suspicion later confirmed by the findings of the study is that defining short haul air transportation regions on the basis of a fixed region size can be insufficient and misleading. In a typical short haul region a good proportion of the flights actually originate and terminate outside the region and serve the cities in it as stops on multi-stop long haul routes. It is shown later that this is in fact the case in this study region. Another reason for the inadequacy of any fixed size definition for a short haul region is that adjacent region overlap and interact strongly, so that it is difficult, if not meaningless to isolate demand and supply patterns on the basis of fixed line boundaries.

In this case, the selected study region is used in an exploratory manner. The interest is more with traffic patterns and flight itineraries *within* the region. The specific trip length that would constitute short

haul air transportation becomes a matter of what aircraft technology is being considered, and is affected by the extent to which competition from other modes of transportation is present.

Figures 2-1 shows the delineated study region centered around Atlanta, its major hub. The region contains 87 cities connected by air service to Atlanta and among themselves. These cities are shown in Tables 2-1 and 2-2. The average distance between these cities and Atlanta is 284 miles. The distributions of distances to Atlanta are shown in Figure 2-2, separately for hubs and non-hubs<sup>(2)</sup>. These distributions show an interesting pattern whereby the larger cities (the hubs) are distributed at larger distances from Atlanta and relatively more uniformly throughout the region. The smaller cities (non-hubs) are closer in and distributed with a tendency towards a concentration along a ring at 250 miles from Atlanta.

As shown in Fig. 2-1, a number of larger cities lie close to the boundary of the study region, on either side of it, e.g. St. Louis, Pittsburgh, Washington, D.C. and Chicago. This serves to illustrate the point made earlier regarding the efficacy of a fixed boundary for a short haul region. It would be expected that some of these cities have short haul regions of their own and that hub and spoke patterns overlap with the one centered on Atlanta to create a maze of short haul regions that itself is much larger than 500 miles and forms part of the fabric of the long haul air transport network in the Eastern United States.

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<sup>(2)</sup> Large Hubs are those handling 1% or more of the total number of passengers enplaned in the U.S. (equivalent to 1,985,454 or more in 1974).  
 Medium Hubs are those handling 0.25% to 0.99% of the total number of passengers enplaned in the U.S. (equivalent to 496,363 to 1,985,453 in 1974).  
 Small Hubs are those handling 0.05% to 0.24% of the total number of passengers enplaned in the U.S. (equivalent to 99,273 to 496,362 in 1974).  
 Non-Hubs are those handling less than 0.05% of the total number of passengers enplaned in the U.S. (equivalent to less than 99,273 in 1974).

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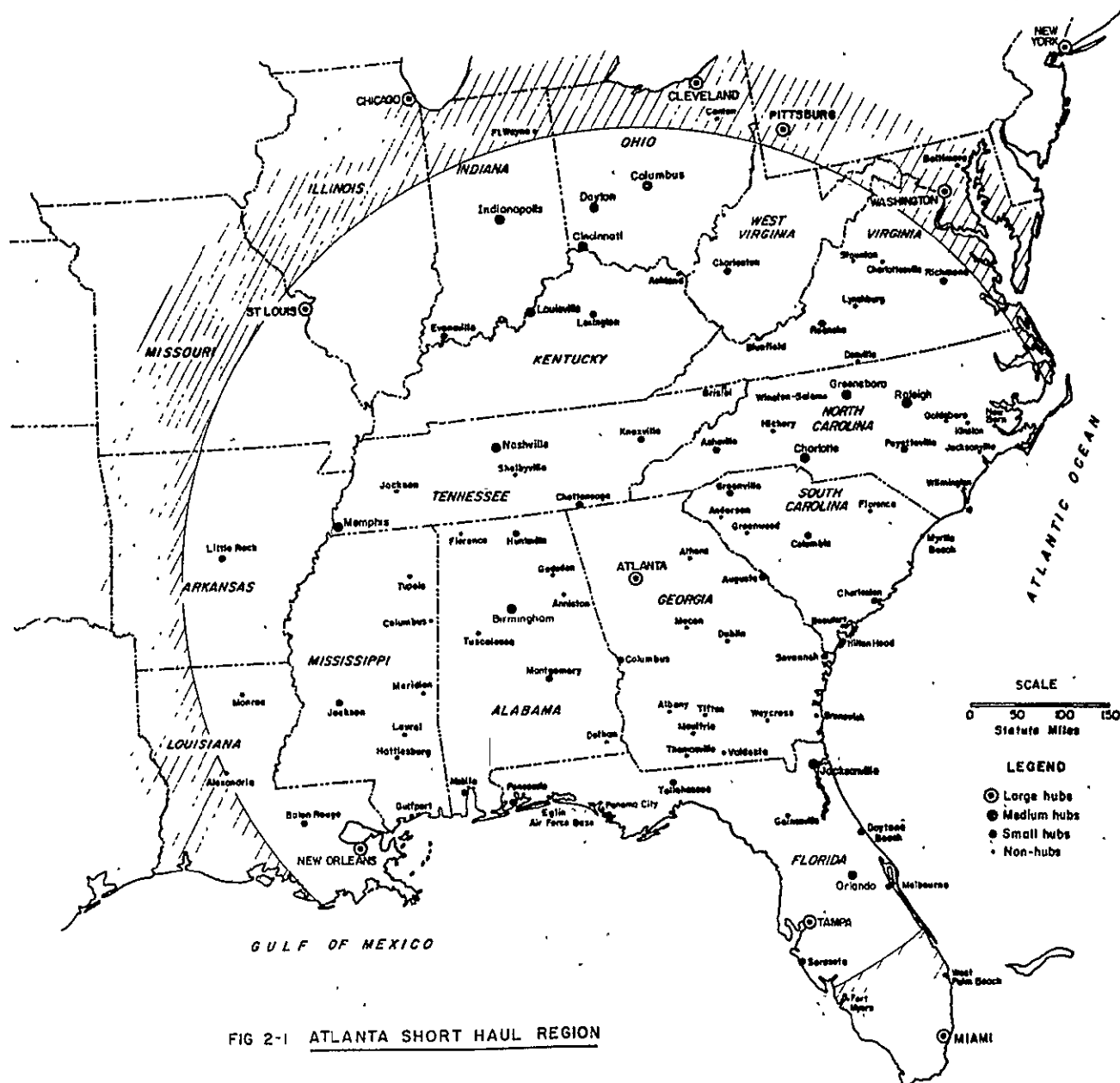


FIG 2-1 ATLANTA SHORT HAUL REGION

## EXPLANATORY NOTES - FIGURE 2-1

1. Florence, AL and Muscle Shoals, AL use the same airport and the names are used interchangeably.
2. Bristol, TN is also referred to as Tri-City Airport (Bristol-Kingsport-Johnson City) in some sources.
3. Ashland, KY also serves Huntington, VA.
4. Moultrie and Thomasville, GA, passenger data is recorded together but the OAG lists separate flight schedules.

TABLE 2-1

LARGE, MEDIUM AND SMALL HUBS, SERVED BY CERTIFICATED AIRLINES ONLY

| Mileage Block | City, STATE      | Airport Code | Distance to Atlanta | Hub Size |
|---------------|------------------|--------------|---------------------|----------|
| 0-100         | Columbus, GA     | CSG          | 83                  | S        |
| 100-200       | Asheville, NC    | AVL          | 164                 | S        |
|               | Augusta, GA      | AGS          | 143                 | S        |
|               | Birmingham, AL   | BHM          | 134                 | M        |
|               | Chattanooga, TN  | CHA          | 106                 | S        |
|               | Columbia, SC     | CAE          | 192                 | S        |
|               | Greenville, SC   | GSP          | 154                 | S        |
|               | Huntsville, AL   | HSV          | 151                 | S        |
|               | Knoxville, TN    | TYS          | 152                 | S        |
|               | Montgomery, AL   | MGM          | 147                 | S        |
| 200-300       | Charleston, SC   | CHS          | 259                 | S        |
|               | Charlotte, NC    | CLT          | 227                 | M        |
|               | Jacksonville, FL | JAX          | 270                 | M        |
|               | Nashville, TN    | BNA          | 214                 | M        |
|               | Pensacola, FL    | PNS          | 272                 | S        |
|               | Savannah, GA     | SAV          | 215                 | S        |
|               | Tallahassee, FL  | TLH          | 223                 | S        |
| 300-400       | Charleston, WV   | CRW          | 363                 | S        |
|               | Cincinnati, OH   | CVG          | 373                 | M        |
|               | Daytona Bch., FL | DAB          | 366                 | S        |
|               | Evansville, IN   | EVV          | 350                 | S        |
|               | Fayetteville, NC | FAY          | 330                 | S        |
|               | Greensboro, NC   | GSO          | 306                 | M        |
|               | Roanoke, VA      | ROA          | 357                 | S        |
|               | Jackson, MS      | JAN          | 341                 | S        |
|               | Lexington, KY    | LEX          | 303                 | S        |
|               | Louisville, KY   | SDF          | 321                 | M        |
|               | Memphis, TN      | MEM          | 332                 | M        |
|               | Mobile, AL       | MOB          | 302                 | S        |
|               | Raleigh, NC      | RDU          | 356                 | M        |
| 400-500       | Baton Rouge, LA  | BTR          | 449                 | S        |
|               | Columbus, OH     | CMH          | 446                 | M        |
|               | Dayton, OH       | DAY          | 432                 | M        |
|               | Indianapolis, IN | IND          | 432                 | M        |
|               | Little Rock, AR  | LIT          | 453                 | S        |
|               | Melbourne, FL    | MLB          | 443                 | S        |
|               | Tampa, FL        | TPA          | 412                 | L        |
|               | New Orleans, LA  | MSY          | 425                 | L        |
|               | Orlando, FL      | MCO          | 400                 | M        |
|               | Richmond, VA     | RIC          | 481                 | S        |
|               | St. Louis, MO    | STL          | 484                 | L        |
|               | Sarasota, FL     | SRQ          | 444                 | S        |

TABLE 2-2

NON HUBS SERVED BY CERTIFICATED AND COMMUTER AIRLINES<sup>(1)</sup>

| Mileage Block | City, STATE       | Airport Code | Distance to Atlanta | Hub Size |
|---------------|-------------------|--------------|---------------------|----------|
| 0-100         | Anniston, AL      | ANB          | 82                  | N        |
|               | Athens, GA        | AHN          | 67                  | N        |
|               | Gadsen, AL        | GAD          | 98                  | N        |
|               | Macon, GA         | MCN          | 79                  | N        |
| 100-200       | Albany, GA        | ABY          | 146                 | N        |
|               | Anderson, SC      | AND          | 115                 | N        |
|               | Dothan, AL        | DNH          | 171                 | N        |
|               | *Dublin, GA       | DBN          | 112                 | N        |
|               | Greenwood, SC     | GRD          | 137                 | N        |
|               | Moultrie/         |              |                     |          |
|               | **Thomasville, GA | MGR          | 180                 | N        |
|               | Muscle Shoals/    |              |                     |          |
|               | Florence, AL      | MSL          | 198                 | N        |
| 200-300       | *Tifton, GA       | TMI          | 162                 | N        |
|               | Tuscaloosa, AL    | TCL          | 186                 | N        |
|               | *Beaufort, SC     | BFT          | 229                 | N        |
|               | Bristol, TN       | TRI          | 227                 | N        |
|               | **Brunswick, GA   | SSI          | 247                 | N        |
|               | Columbus, MS      | GTR          | 241                 | N        |
|               | Eglin A.F.B., FL  | VPS          | 250                 | N        |
|               | Florence, SC      | FLO          | 273                 | N        |
|               | Hickory, NC       | HKY          | 225                 | N        |
|               | **Hilton Head, SC | HHH          | 239                 | N        |
|               | Jackson, TN       | MKL          | 289                 | N        |
|               | London, KY        | LOZ          | 239                 | N        |
|               | Meridan, MS       | MEI          | 267                 | N        |
|               | Panama City, FL   | PFN          | 247                 | N        |
|               | Tupelo, MS        | TUP          | 253                 | N        |
|               | Valdosta, GA      | VLD          | 208                 | N        |
|               | *Waycross, GA     | AYS          | 203                 | N        |
|               | Winston Salem, NC | INT          | 294                 | N        |
| 300-400       | Ashland, WV       | HTS          | 342                 | N        |
|               | Danville, VA      | DAN          | 352                 | N        |
|               | Gainesville, FL   | GNV          | 300                 | N        |
|               | Goldsboro, NC     | GSB          | 387                 | N        |
|               | Laurel, MS        | PIB          | 308                 | N        |
|               | Lynchburg, VA     | LYH          | 389                 | N        |
|               | Myrtle Beach, SC  | CRE          | 329                 | N        |
|               | Wilmington, NC    | ILM          | 377                 | N        |
|               | Gulfport, MS      | GPT          | 352                 | N        |

TABLE 2-2 (continued)

| Mileage Block | City, STATE         | Airport Code | Distance to Atlanta | Hub Size |
|---------------|---------------------|--------------|---------------------|----------|
| 400-500       | Alexandria, LA      | ESF          | 485                 | N        |
|               | Charlottesville, VA | CHO          | 457                 | N        |
|               | Jacksonville, NC    | OAJ          | 407                 | N        |
|               | Kinston, NC         | ISO          | 406                 | N        |
|               | New Bern, NC        | EWN          | 433                 | N        |
|               | Staunton, VA        | SHD          | 444                 | N        |
|               | Monroe, LA          | MLU          | 448                 | N        |

\* The city is served by commuter only.

\*\* The city is served by both certificated and commuter carriers.

(1) All cities are served by certificated carriers with Atlanta, with a few exceptions.



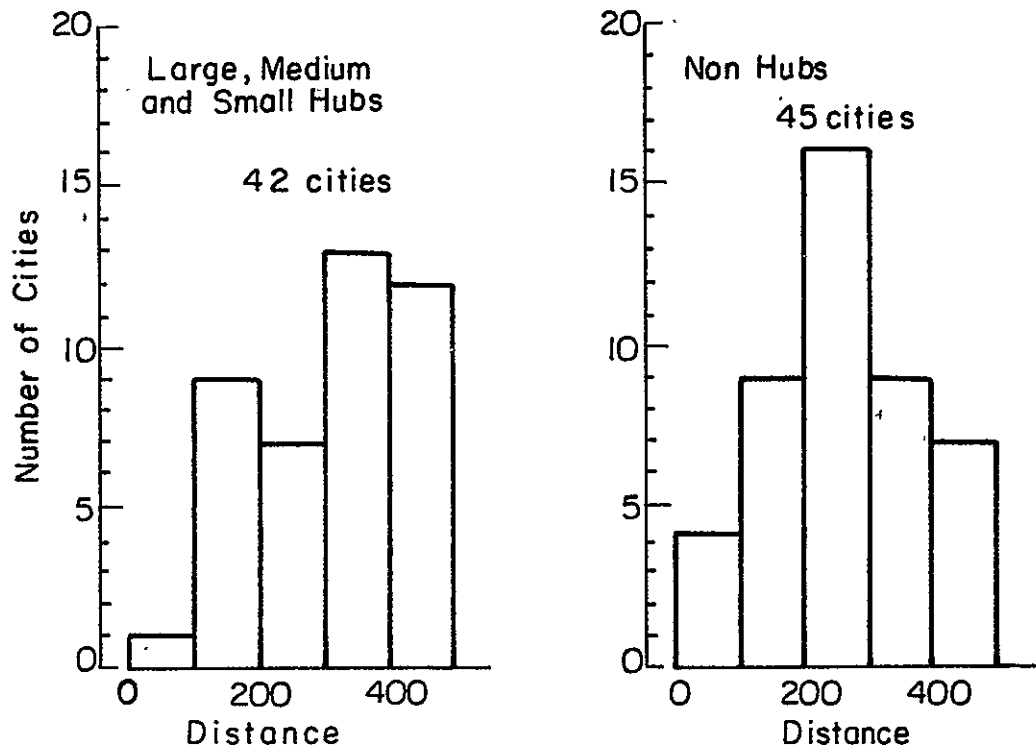


FIGURE 2-2 DISTRIBUTION OF CITIES BY MILEAGE BLOCKS

Most analyses in this study are conducted for these cities within the region having 4000 annual origin destination passengers with Atlanta or more. There are 72 such cities for which origin destination data are compiled. Three other cities are included in the study, but no origin destination data are compiled for them. The reason for this distinction is related to data sources. The first group of cities are served connected to Atlanta by certificated air carrier service. This means that origin destination traffic data for these cities are available from CAB sources. In an earlier report of this study\*, the feasibility of data acquisition from various sources was evaluated. The CAB origin destination data is most easily accessed through the use of a commercial computer service system offered by I.P. Sharp Associates<sup>(3)</sup>.

The other three cities included in this study are connected to Atlanta by non-certificated commuter air service. Origin destination data for this type of service are not usually available, and consequently, only traffic and service data are compiled for these cities. The proportion of the Atlanta traffic within the region that is served by commuter carriers is rather small: 3.2% or 92,650 passengers in 1974. Therefore, it is believed that this does not constitute a major data deficiency, particularly since this study is focused on Atlanta, the major hub of the study area.

The only passenger traffic data not available by the CAB O-D survey tables are those of the passengers travelling through any specific city. These data are available in what is referred to as the CAB Service Segment Data Files, and are written on magnetic tapes available from the U.S. National Archives. A sample of these data for a one month period was obtained and some analysis is currently underway to determine the magnitude and consequently

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\* See footnote (1).

<sup>(3)</sup> See Appendix III for a description of the I.P. Sharp system and of the computer programs used for accessing it.

the importance of including through traffic data in this analysis<sup>(4)</sup>.

Other data sources used in this study include the Donnelly Official Airline Guide (OAG) for data on service profiles including flight frequencies, and available seats on each link in the system; and various publications of the Atlanta Regional Planning Commission for socioeconomic data compiled in this study.

The data acquired in this study were all referring to 1974. The reason for this is that that year was the most recent year for which all necessary data were consistently available.

#### Historic Background on Study Area

The rapid growth of air passenger activity at Atlanta in recent years is well-documented. It is known that the larger part (approximately 70%) of the traffic consists of passengers making connections between flights at Atlanta. The growth of total enplanements at Atlanta and of passenger traffic originating at Atlanta are shown in Figure 2-3. The total growth of enplanements during the period 1966 to 1974 was 171%. Traffic from Atlanta grew 139% during the same period. Thus, it can be seen that connecting traffic at Atlanta has been increasing at a faster rate than Atlanta traffic.

During the same period, short haul traffic at Atlanta grew by 111%. This lower growth rate is not surprising, since due to the increase in connecting traffic it can be expected that more short haul to long haul connections occur, thereby causing long haul traffic to increase both due to the increase in short haul traffic and in the long haul traffic demand itself. Furthermore, short haul air transportation faced competition in some markets from ground transportation modes and this may be a factor in

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<sup>(4)</sup> See Appendix II for a discussion of the significance of through passengers data.

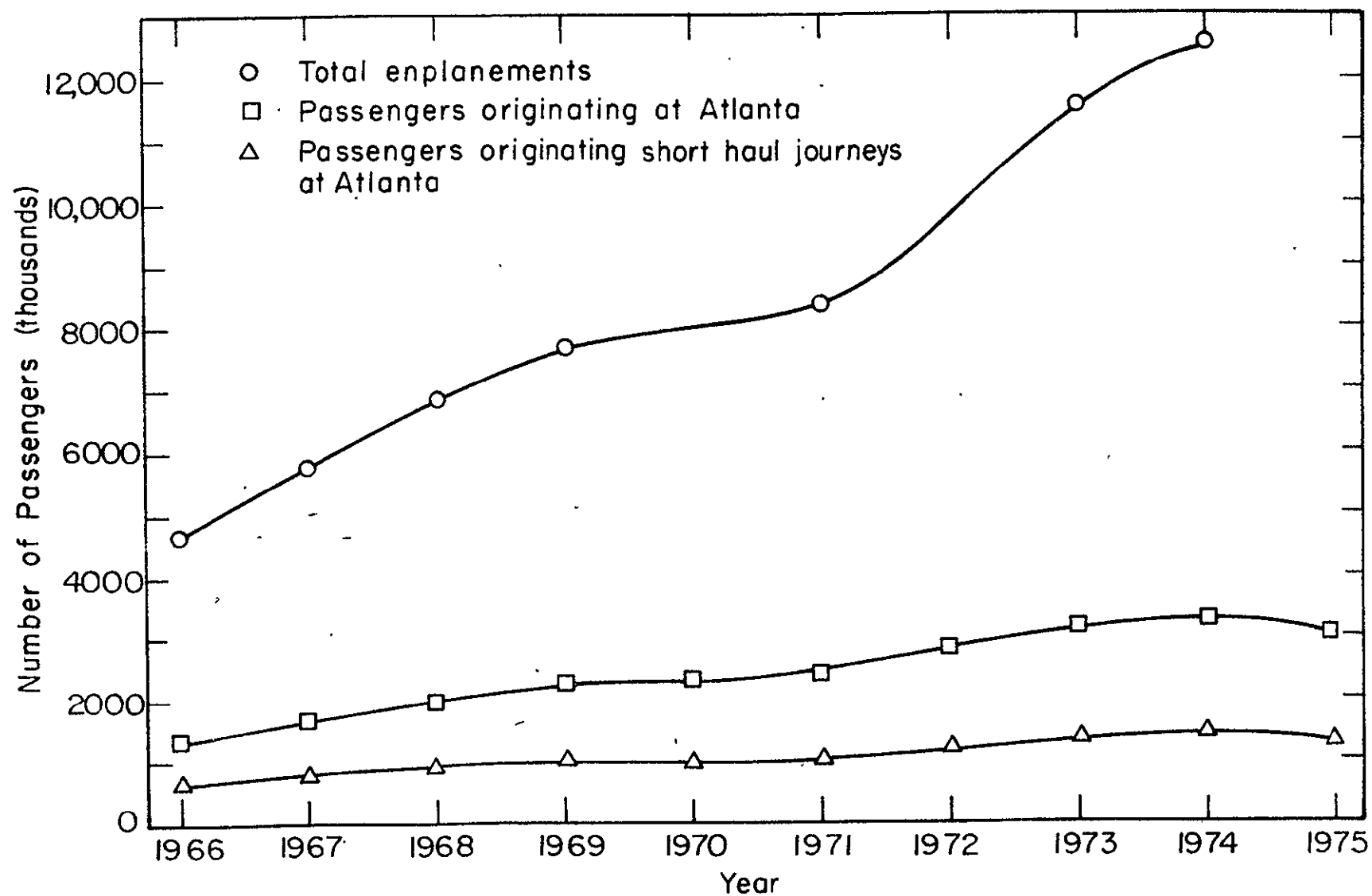


FIG. 2-3 GROWTH OF PASSENGER ACTIVITY AT ATLANTA.

EXPLANATORY NOTES FOR FIGURE 2-3  
GROWTH OF PASSENGER ACTIVITY AT ATLANTA

1. Data for total enplanements are from FAA Statistical Handbook of Aviation.
2. Total enplanements includes passengers originating journeys at Atlanta and passengers making connections to or travelling through on onward flights at Atlanta.
3. Data for passengers originating journeys at Atlanta are from Civil Aeronautics Board Origin Destination Surveys. CAB data is for two-way traffic. It is assumed that originating passengers are one half of originating and terminating passengers.
4. Note 3 applies to passengers originating short haul journeys at Atlanta. Short haul is considered as journeys of less than 500 miles.

lowering the growth rates of this type of traffic.

The growth of origin destination traffic for Atlanta is shown in Table 2-3 for the 72 cities included in the study. The grouping into mileage blocks indicates a higher growth rate for the cities at 400-500 miles. This may be due to the fact that Florida traffic alone increase by 161% during the period, with Florida containing some of the larger cities in this mileage block, e.g. Tampa and Orlando.

These high growth rates, and the interesting complexity and high connectivity of the short haul air transportation region of Atlanta makes it a suitable study area for a study aimed ultimately at performing a technology assessment of short haul aircraft.

#### Outline of This Report

The next chapter of this report is concerned with a socioeconomic profile of Atlanta and the study region. This is followed by a Chapter describing the origin destination patterns of Atlanta short haul traffic. Chapter 5 deals with the interaction of the traffic generated in the study region with Atlanta and focuses on the characteristics of transfer traffic at that city. Chapters 6 and 7 deal with a comparison of traffic and supply patterns for Atlanta and the rest of the region respectively. These are following by a concluding chapter summarizing the highlights of this investigation. To this report are attached three appendices. Appendix I describes the ground access system at Atlanta. Appendix II discusses the characteristics of through passengers and the means for accessing through trip data. Finally, Appendix III describes the I.P. Sharp data accessing system and the computer program needed for its use.

TABLE 2-3

GROWTH OF O-D TRAFFIC BETWEEN ATLANTA  
AND 72 SHORT HAUL CITIES STUDIED

| Mileage<br>Blocks             | # of O-D Passengers |           | Growth<br>% |
|-------------------------------|---------------------|-----------|-------------|
|                               | 1966                | 1974      |             |
| 0-100                         | 36,190              | 26,030    | -28         |
| 100-200                       | 300,260             | 444,960   | 48          |
| 200-300                       | 332,430             | 710,380   | 113         |
| 300-400                       | 316,500             | 756,640   | 139         |
| 400-500                       | 321,350             | 866,970   | 170         |
| Total for<br>the 72<br>cities | 1,306,730           | 2,804,980 | 114         |

### 3. SOCIO-ECONOMIC CHARACTERISTICS

The population of major cities in the U.S. is measured in various ways (city boundary, urbanized area, SMSA). This study adopts the Standard Metropolitan Statistical Area (SMSA) as the basis for population figures for Atlanta and for other major cities. In 1970 the Atlanta SMSA was defined as that area including the five counties of Clayton, Cobb, DeKalb, Fulton and Gwinette, (Figure 3-1). Between 1960 and 1970 the population of these five counties grew from 1,017,188 to 1,390,164--a total growth of 36.7%. During this same period the population growth for the whole United States was 13.3%.

In 1973 the Atlanta SMSA was extended to include also the counties of Douglas, Rockdale, Butts, Cherokee, Fayette, Forsyth, Henry, Newton, Paulding and Walton (Figure 3-1). The total population of the area covered by this extended SMSA was 1,597,816, in 1970. —

The Atlanta Regional Commission, which is responsible for planning in Atlanta, has jurisdiction over the Atlanta Regional Commission Planning Area (ARCPA) which includes the five counties of the 1970 SMSA and in addition the two counties of Douglas and Rockdale (Figure 3-1). Population growth within this planning area is shown in Table 3-1. The 1970 population was 1,434,676. The Atlanta Regional Commission (ARC) forecasts a future annual population growth between 2.4% and 3.5%, which would result in a population of between 2.95 and 4.08 million by the year 2000. (Ref: ARC Regional Development Plan, 1976).



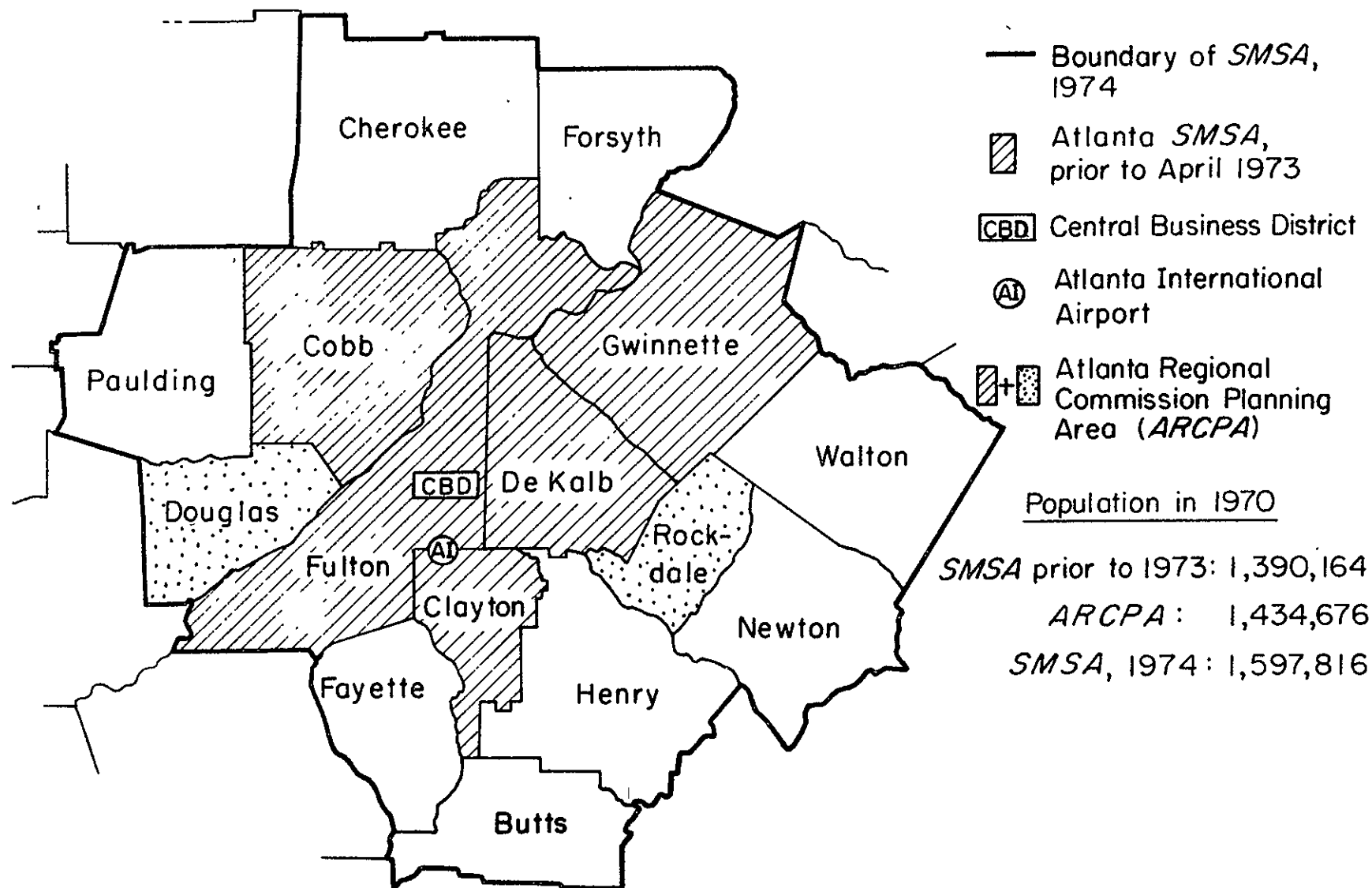


FIG. 3-1 ATLANTA *SMSA* AND *ARCPA*

TABLE 3-1

## POPULATION GROWTH OF THE ATLANTA REGION 1950-1975

| <u>Population</u>                        | <u>1950</u>  | <u>1960</u>  | <u>1970</u>  | <u>1975</u>  |
|------------------------------------------|--------------|--------------|--------------|--------------|
| <u>Atlanta Region</u>                    | 747,626      | 1,044,321    | 1,434,676*   | 1,652,000    |
| Clayton County                           | 22,872       | 46,365       | 98,126*      | 131,200      |
| Cobb County                              | 61,830       | 114,174      | 196,793      | 249,800      |
| DeKalb County                            | 136,395      | 256,782      | 415,387      | 463,600      |
| Douglas County                           | 12,173       | 16,741       | 28,659       | 45,600       |
| Fulton County                            | 473,572      | 556,146      | 605,210*     | 618,100      |
| Gwinnett County                          | 32,320       | 43,541       | 72,349       | 115,400      |
| Rockdale County                          | 8,464        | 10,572       | 18,152       | 28,300       |
| <u>Percent of Total</u>                  |              |              |              |              |
| <u>Atlanta Region</u>                    | <u>100.0</u> | <u>100.0</u> | <u>100.0</u> | <u>100.0</u> |
| Clayton County                           | 3.1          | 4.4          | 6.8          | 7.9          |
| Cobb County                              | 8.3          | 10.9         | 13.7         | 15.1         |
| DeKalb County                            | 18.2         | 24.6         | 29.0         | 28.1         |
| Douglas County                           | 1.6          | 1.6          | 2.0          | 2.8          |
| Fulton County                            | 63.4         | 53.3         | 42.2         | 37.4         |
| Gwinnett County                          | 4.3          | 4.2          | 5.0          | 7.0          |
| Rockdale County                          | 1.1          | 1.0          | 1.3          | 1.7          |
| <u>Average Annual Increase (Percent)</u> |              |              |              |              |
| <u>Atlanta Region</u>                    | -            | 3.4          | 3.2          | 2.9          |
| Clayton County                           | -            | 7.3          | 7.8          | 6.0          |
| Cobb County                              | -            | 6.3          | 5.6          | 4.9          |
| DeKalb County                            | -            | 6.5          | 4.9          | 2.2          |
| Douglas County                           | -            | 3.3          | 5.7          | 9.7          |
| Fulton County                            | -            | 1.6          | .8           | .4           |
| Gwinnett County                          | -            | 3.0          | 5.2          | 9.8          |
| Rockdale County                          | -            | 2.3          | 5.6          | 9.3          |

SOURCE: 1975 Population and Housing, Atlanta Regional Commission

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There are no major physical barriers around Atlanta and growth has taken place in all directions from the city center. The fastest growth, measured as net increase in population, has been in the NNW and ENE directions (Figure 3-2). Professional service employment has tended to move northward from the core of the city, although rebuilding of the CBD has now halted the flow of jobs from downtown. Population distribution between the counties of the ARCPA is shown in Table 3-1. It can be seen that in 1975 80.6% of the population was concentrated in Fulton, DeKalb and Cobb counties. The Atlanta International Airport is located south of the city center, but close to the periphery of these most densely populated counties (Figure 3-1).

The growth of Atlanta SMSA between 1960 and 1970 is compared to that of other major cities in the southeast, in Table 3-2. Growth of the Atlanta SMSA has been considerably greater than that of most other cities in the Table. Miami, Florida and Tampa, Florida are the only cities which show growth at all comparable to Atlanta.

The 1970 population and the 1960-1970 population growth of all large, medium and small hubs in the study region are shown in Table 3-3. The same data for non hubs are shown in Table 3-4. Population growth for all states of the southeastern U.S. are shown in Table 3-5. Hubs in Florida, and the state as a whole, can be seen to exhibit high population growth. As noted in the introduction to this report connecting traffic at Atlanta has grown at a higher rate than Atlanta traffic. Florida, as will be seen later, contributes a high percentage of the connecting traffic at Atlanta. The high population growth of Florida has undoubtedly contributed to the growth of connecting traffic at Atlanta. Florida's attractiveness for vacations could be another factor influencing growth of connecting traffic at Atlanta.

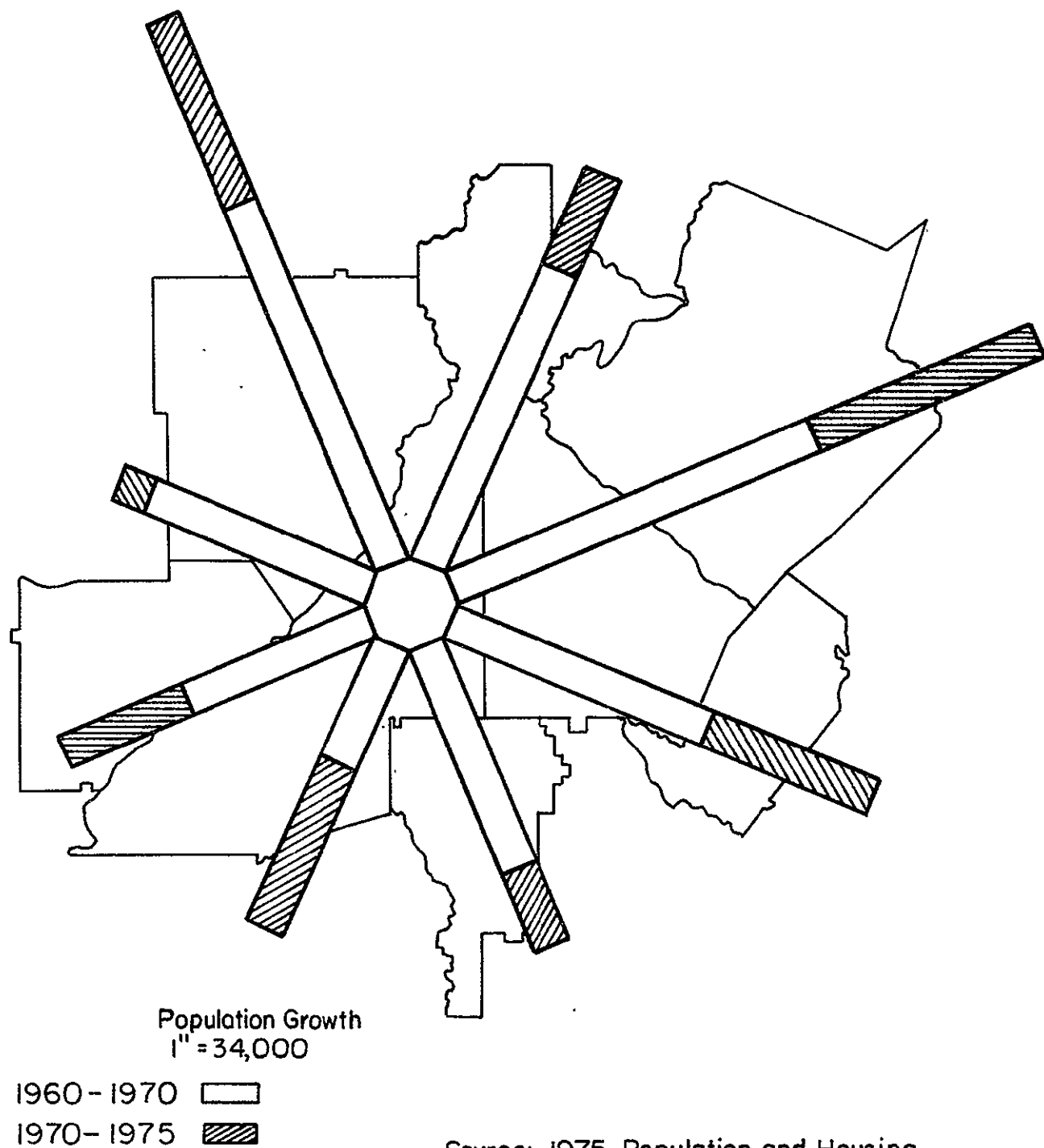


FIG. 3-2 DIRECTIONS OF GROWTH IN THE ATLANTA REGION

TABLE 3-2

POPULATION GROWTH OF MAJOR METROPOLITAN AREAS IN THE S.E. OF THE U.S.

SMSA's RANKED IN ORDER OF SIZE IN 1970.

| City             | Population |           | % Change |
|------------------|------------|-----------|----------|
|                  | 1970       | 1960      |          |
| St. Louis, MO    | 2,363,017  | 2,104,669 | 12.3%    |
| Cleveland, OH    | 2,064,194  | 1,909,483 | 8.1      |
| Atlanta, GA      | 1,390,164  | 1,017,188 | 36.7     |
| Cincinnati, OH   | 1,384,851  | 1,268,479 | 9.2      |
| Miami, FL        | 1,267,792  | 935,047   | 35.6     |
| Kansas, MO       | 1,253,916  | 1,092,545 | 14.8     |
| Indianapolis, IN | 1,109,882  | 994,475   | 17.5     |
| New Orleans, LA  | 1,045,809  | 907,123   | 15.3     |
| Tampa, FL        | 1,012,594  | 772,453   | 31.1     |
| Louisville, KY   | 826,553    | 725,139   | 14.0     |
| Memphis, TN      | 770,120    | 674,583   | 14.2     |
| Birmingham, AL   | 739,274    | 721,207   | 2.5      |
| Norfolk, VA      | 680,600    | 578,507   | 17.6     |
| Gary, IN         | 633,367    | 573,548   | 10.4     |
| Columbia, SC     | 332,880    | 260,828   | 23.8     |
| Little Rock, AR  | 323,296    | 271,936   | 18.9     |
| Jackson, MS      | 258,906    | 221,367   | 17.0     |
| Charleston, WV   | 229,515    | 252,925   | -9.3     |

SOURCE: Official publications of U.S. Bureau of the Census

TABLE 3-3  
POPULATION AND POPULATION GROWTH  
FOR LARGE, MEDIUM AND SMALL HUBS

| <u>STATE</u><br>City | <u>Population</u> | <u>Percentage Growth</u><br>(1960 - 1970) |
|----------------------|-------------------|-------------------------------------------|
| <u>ALABAMA</u>       |                   |                                           |
| Birmingham           | 739,000           | 2.5                                       |
| Huntsville           | 228,000           | 48.3                                      |
| Mobile               | 377,000           | 3.7                                       |
| Montgomery           | 201,000           | 0.8                                       |
| <u>ARKANSAS</u>      |                   |                                           |
| Little Rock          | 323,000           | 18.9                                      |
| <u>FLORIDA</u>       |                   |                                           |
| Daytonna Beach       | 45,000            | 21.2                                      |
| Jacksonville         | 529,000           | 16.1                                      |
| Melbourne            | 40,000            | 235.6                                     |
| Orlando              | 428,000           | 34.4                                      |
| Pensacola            | 243,000           | 19.5                                      |
| Sarasota             | 40,000            | 18.1                                      |
| Tallahassee          | 103,000           | 38.8                                      |
| Tampa                | 1,013,000         | 31.1                                      |
| <u>GEORGIA</u>       |                   |                                           |
| Atlanta              | 1,390,000         | 36.7                                      |
| Augusta              | 253,000           | 17.0                                      |
| Columbus             | 239,000           | 9.4                                       |
| Savannah             | 188,000           | -0.3                                      |
| <u>INDIANA</u>       |                   |                                           |
| Evansville           | 233,000           | 4.4                                       |
| Indianapolis         | 1,110,000         | 17.5                                      |
| <u>KENTUCKY</u>      |                   |                                           |
| Lexington            | 174,000           | 32.2                                      |
| Louisville           | 827,000           | 14.0                                      |

TABLE 3-3 (continued)

| <u>STATE</u><br>City  | <u>Population</u> | <u>Percentage Growth</u><br>(1960 - 1970) |
|-----------------------|-------------------|-------------------------------------------|
| <u>LOUISIANA</u>      |                   |                                           |
| Baton Rouge           | 285,000           | 24.0                                      |
| Monroe                | 115,000           | 13.5                                      |
| New Orleans           | 1,046,000         | 15.3                                      |
| <u>MISSISSIPPI</u>    |                   |                                           |
| Gulfport              | 135,000           | 12.6                                      |
| Jackson               | 259,000           | 17.0                                      |
| <u>MISSOURI</u>       |                   |                                           |
| St. Louis             | 2,363,000         | 12.3                                      |
| <u>NORTH CAROLINA</u> |                   |                                           |
| Asheville             | 145,000           | 11.4                                      |
| Charlotte             | 409,000           | 29.2                                      |
| Fayetteville          | 212,000           | 42.9                                      |
| Greensboro            | 604,000           | 16.1                                      |
| Raleigh               | 228,000           | 35.1                                      |
| <u>OHIO</u>           |                   |                                           |
| Cincinnati            | 1,385,000         | 14.0                                      |
| Columbus              | 916,000           | 21.4                                      |
| Dayton                | 850,000           | 9.2                                       |
| <u>SOUTH CAROLINA</u> |                   |                                           |
| Charleston            | 304,000           | 19.4                                      |
| Columbia              | 323,000           | 23.8                                      |
| Greenville            | 300,000           | 17.1                                      |

TABLE 3-3 (continued)

| <u>STATE</u><br>City | <u>Population</u> | <u>Percentage Growth</u><br>(1960 - 1970) |
|----------------------|-------------------|-------------------------------------------|
| <u>TENNESSEE</u>     |                   |                                           |
| Chattanooga          | 305,000           | 7.7                                       |
| Knoxville            | 400,000           | 8.8                                       |
| Memphis              | 770,000           | 14.2                                      |
| Nashville            | 541,000           | 16.7                                      |
| <u>VIRGINIA</u>      |                   |                                           |
| Richmond             | 518,000           | 18.9                                      |
| Roanoke              | 181,000           | 14.3                                      |
| <u>WEST VIRGINIA</u> |                   |                                           |
| Charleston           | 229,000           | -9.3                                      |

SOURCE: Official publication of the U.S. Bureau of the Census.



TABLE 3-4

## POPULATION &amp; POPULATION GROWTH FOR NON-HUBS:

| <u>STATE</u><br>City        | <u>Population</u> | <u>Percentage Growth</u><br>(1960-1970) |
|-----------------------------|-------------------|-----------------------------------------|
| <u>ALABAMA</u>              |                   |                                         |
| Dothan                      | 37,000            | 16.8                                    |
| Florence<br>(Muscle Shoals) | 34,000            | 7.5                                     |
| Tuscaloosa                  | 116,000           | 6.4                                     |
| <u>ARKANSAS</u>             |                   |                                         |
| <u>FLORIDA</u>              |                   |                                         |
| Eglin Air Force Base        | 8,000             |                                         |
| Gainesville                 | 105,000           | 41.4                                    |
| Panama City                 | 32,000            | -3.5                                    |
| <u>GEORGIA</u>              |                   |                                         |
| Albany                      | 90,000            | 18.4                                    |
| Athens                      | 44,000            | 41.4                                    |
| Brunswick                   | 20,000            | -9.8                                    |
| Macon                       | 206,000           | 14.4                                    |
| Moultrie                    | 14,000            | -9.3                                    |
| Thomasville                 | 18,000            | -0.5                                    |
| Valdosta                    | 32,000            | 5.4                                     |
| Waycross                    | 19,000            | -9.3                                    |
| <u>INDIANA</u>              |                   |                                         |
| <u>KENTUCKY</u>             |                   |                                         |
| Ashland                     | 29,000            | -0.4                                    |
| <u>LOUISIANA</u>            |                   |                                         |
| Alexandria                  | 42,000            | 3.2                                     |

TABLE 3-4 (continued)

| <u>STATE</u><br><u>City</u> | <u>Population</u>    | <u>Percentage Growth</u><br><u>(1960 - 1970)</u> |
|-----------------------------|----------------------|--------------------------------------------------|
| <u>MISSISSIPPI</u>          |                      |                                                  |
| Columbus                    | 26,000               | 4.1                                              |
| Hattiesburgh                | 38,000               | 9.4                                              |
| Laurel                      | 24,000               | -13.4                                            |
| Meridian                    | 45,000               | -8.7                                             |
| Tupelo                      | 21,000               | 18.9                                             |
| <u>MISSOURI</u><br>--       |                      |                                                  |
| <u>NORTH CAROLINA</u>       |                      |                                                  |
| Goldsboro                   | 27,000               | -7.1                                             |
| Hickory                     | 21,000               | 6.4                                              |
| Jacksonville                | 16,000               | 18.8                                             |
| Kinston                     | 22,000               | -10.1                                            |
| New Bern                    | 15,000               | -6.7                                             |
| Wilmington                  | 107,000              | 16.5                                             |
| <u>OHIO</u><br>--           |                      |                                                  |
| <u>SOUTH CAROLINA</u>       |                      |                                                  |
| Beaufort                    | 9,000                | 49.8                                             |
| Florence                    | 26,000               | 5.2                                              |
| Hilton Head                 | <i>not available</i> |                                                  |
| Myrtle Beach                | 9,000                | 9.0                                              |
| <u>TENNESSEE</u>            |                      |                                                  |
| Bristol                     | 20,000               | 14.1                                             |
| Jackson                     | 40,000               | 16.3                                             |
| Shelbyville                 | 12,000               | 17.2                                             |
| <u>VIRGINIA</u>             |                      |                                                  |
| Bluefield                   | 5,000                | 24.8                                             |
| Charlottesville             | 39,000               | 32.1                                             |
| Danville                    | 46,000               | -0.4                                             |
| Lynchburg                   | 123,000              | 11.5                                             |
| Staunton                    | 25,000               | 10.2                                             |
| <u>WEST VIRGINIA</u><br>--  |                      |                                                  |

SOURCE: Official Publications of the U.S. Bureau of the Census

TABLE 3-5

## POPULATION OF THE STATES IN THE SOUTHEAST UNITED STATES (1973)

| State          | 1973<br>Population<br>(millions) | Rank<br>in U.S. | Density<br>(per sq. mi.) | Average<br>Annual Change<br>1970 - 1973. |
|----------------|----------------------------------|-----------------|--------------------------|------------------------------------------|
| Alabama        | 3.539                            | 21              | 70                       | 0.8                                      |
| Arkansas       | 2.037                            | 33              | 84                       | 1.0                                      |
| Florida        | 7.678                            | 8               | 142                      | 3.8                                      |
| Georgia        | 4.786                            | 14              | 82                       | 1.3                                      |
| Indiana        | 5.316                            | 11              | 147                      | 0.7                                      |
| Kentucky       | 3.342                            | 23              | 84                       | 1.2                                      |
| Louisiana      | 3.764                            | 20              | 84                       | 1.0                                      |
| Mississippi    | 2.281                            | 29              | 48                       | 0.9                                      |
| Missouri       | 2.757                            | 15              | 69                       | 0.5                                      |
| North Carolina | 5.273                            | 12              | 108                      | 1.1                                      |
| Ohio           | 10.731                           | 6               | 262                      | 0.2                                      |
| South Carolina | 2.726                            | 26              | 90                       | 1.6                                      |
| Tennessee      | 4.126                            | 17              | 100                      | 1.5                                      |
| Virginia       | 4.811                            | 13              | 121                      | 1.1                                      |
| West Virginia  | 1.794                            | 34              | 75                       | 0.9                                      |

NOTE: Population growth in U.S. 1970-73, 1% per year.

SOURCE: Statistical Abstracts of the U.S. 1974.

Hub size, defined earlier in this report, is related to total enplanements handled by the hub. There is some correlation between hub size and population of cities but many exceptions occur. Therefore, both hub size and population are considered when origin-destination traffic is analyzed in Chapter 4.

Atlanta's economy is diversified. Specialties, compared to the U.S. as a whole, are wholesale trade, transportation/communication/utilities, and finance/insurance/real estate. Manufacturing's role in the economy is less than average for the U.S. Atlanta dominates the southeast in wholesaling, also plays a significant role as a convention hub and as a regional retail center. The airport is considered to have influenced the development of Atlanta as the communication and distribution hub of the southeast. (Ref. ARC Regional Development Plan 1976).

The distribution of the labor force by type of employment for Atlanta SMSA is compared to that of other metropolitan areas in Table 3-6. White collar workers (professional management, sales and clerical) constitute 57.9% of the work force, a figure comparable to that for San Francisco (58.8%) and higher than those for St. Louis, New Orleans, Miami and Houston (51.1% to 52.5%).

During the 1960's Atlanta experienced a surge of national recognition and healthy population and economic growth. Contributing factors were desegregation of public facilities, expansion of the transportation network and an excellent geographic location. Table 3.7 presents the historical growth of median family income for the Atlanta SMSA and several other city SMSA's. The median family income for Atlanta in 1949 was below that of St. Louis, Miami, and Houston, but by 1969 it was above that of all these cities.

TABLE 3-6  
DISTRIBUTION OF LABOR FORCE BY TYPE OF  
EMPLOYMENT IN 1969

SMSA's Compared

| City .<br>Employment       | ATLANTA | ST. LOUIS | NEW ORLEANS | MIAMI   | HOUSTON | SAN FRANCISCO/<br>OAKLAND |
|----------------------------|---------|-----------|-------------|---------|---------|---------------------------|
| Labor Force                | 606,067 | 944,480   | 387,828     | 533,132 | 821,998 | 1,345,161                 |
| # Employed                 | 587,708 | 898,037   | 368,261     | 513,164 | 797,421 | 1,267,643                 |
| Manufacturing              | 19.7    | 28.8      | 14.1        | 14.8    | 20.5    | 16.7                      |
| Whole Sale & Retail        | 23.5    | 21.2      | 23.5        | 23.5    | 22.4    | 20.8                      |
| Services                   | 9.5     | 7.1       | 10.3        | 13.4    | 10.0    | 9.2                       |
| Education Services         | 6.8     | 7.2       | 7.5         | 6.2     | 6.6     | 8.0                       |
| Construction               | 6.4     | 5.0       | 7.2         | 6.9     | 9.4     | 5.4                       |
| Government                 | 15.4    | 13.4      | 15.5        | 11.9    | 10.8    | 19.4                      |
| Profession &<br>Management | 25.9    | 22.9      | 24.6        | 22.5    | 25.3    | 27.6                      |
| Sales & Clerical           | 32.0    | 27.8      | 27.8        | 28.6    | 27.2    | 31.2                      |
| Craftsmen                  | 12.8    | 14.0      | 13.5        | 13.6    | 15.2    | 12.3                      |

SOURCE: National Census County & City Data Book, Table 3, Item 33-49.

TABLE 3-7  
HISTORICAL INCOME TRENDS - SMSA's COMPARED

| City                      | 1949   |            | 1959   |              | 1969   |              |
|---------------------------|--------|------------|--------|--------------|--------|--------------|
|                           | Median | %><br>5000 | Median | %><br>10,000 | Median | %><br>15,000 |
| Atlanta                   | 2936   | 21.1       | 5758   | 20.8         | 10693  | 26.1         |
| St. Louis                 | 3383   | 22.9       | 6243   | 16.7         | 10495  | 22.8         |
| New Orleans               | 2788   | 18.6       | 5195   | 13.4         | 8666   | 17.3         |
| Miami                     | 3130   | 22.2       | 5348   | 14.0         | 10444  | 21.4         |
| Houston                   | 3467   | 25.2       | 5900   | 16.6         | 10190  | 22.6         |
| San Francisco/<br>Oakland | 3935   | 31.9       | 7147   | 24.8         | 11799  | 32.0         |

Source: *National Census County & City Data Book, 1950, 1960 and 1970, Table 3, Items 33-49.*

In 1969 the median family income for Atlanta SMSA was \$10,693 and the area ranked 57 in the U.S. The distribution of family income for Atlanta and several other SMSA's is compared in Table 3-8. Atlanta has 26.6% in the income range under \$7000, while Miami, for instance, has 35.1% indicating a relatively smaller problem of poverty in Atlanta.

Summarizing, the socio-economic characteristics of Atlanta do not indicate that it is vastly different from comparable cities in the U.S., but do reflect the economic health of the city. As mentioned earlier, Atlanta's excellent geographic location is a major contributing factor and this appears to be particularly so in relation to air transportation at Atlanta.

TABLE 3-8  
DISTRIBUTION OF FAMILY MEDIAN INCOME 1969

SMSA's Compared

|                      | ATLANTA | ST LOUIS | NEW ORLEANS | MIAMI  | HOUSTON | SAN FRAN./<br>OAKLAND |
|----------------------|---------|----------|-------------|--------|---------|-----------------------|
| Median Family Income | 10,693  | 10,495   | 8,666       | 10,444 | 10,190  | 11,799                |
| Per Capita           | 3,489   | 3,295    | 2,797       | 3,429  | 3,297   | 4,096                 |
| Families with Income |         |          |             |        |         |                       |
| <3000                | 8.1     | 7.9      | 14.5        | 10.8   | 8.5     | 7.0                   |
| 3000-4999            | 8.1     | 7.7      | 11.4        | 11.3   | 8.6     | 6.7                   |
| 5000-6999            | 10.4    | 9.8      | 12.5        | 13.0   | 11.1    | 8.2                   |
| 7000-9999            | 18.9    | 21.0     | 20.5        | 19.6   | 20.5    | 16.7                  |
| 10,000-14,999        | 28.4    | 30.8     | 23.8        | 23.9   | 28.7    | 29.4                  |
| 15,000-24,999        | 20.1    | 18.0     | 13.0        | 15.1   | 17.4    | 24.4                  |
| >2,500               | 6.0     | 4.8      | 4.3         | 6.3    | 5.2     | 7.6                   |

SOURCE: National Census County & City Data Book, Table 3, Item 33-49.



#### 4. ORIGIN DESTINATION PATTERNS OF ATLANTA SHORT HAUL TRAFFIC

The reason for looking at origin destination traffic patterns rather than total traffic patterns is that the former are a closer indication of the true demand for transportation. In addition to origin-destination traffic, total traffic patterns include connecting and through trips. The presence of such trips on any link of the network is not necessarily an indication of the demand, but of the result of its interaction with a given supply system. Strictly, origin destination traffic flows observed at any point in time may not be a true indication of the demand. This is particularly true in situations where there is inadequate supply and where available capacity is not sufficient to accommodate all the potential demand in a market area. In the case of the Atlanta region, this is not considered to be a major problem, for it is seen that on most of the observed links of the air transportation network there exists adequate capacity, as is shown in a later chapter. Consequently, it is assumed that existing origin destination patterns are a true indication of the demands existing in the study area.

In this chapter a look is taken at the origin destination patterns of travel between Atlanta and the 72 cities in the study region. These patterns are compared with available capacity serving these markets. An attempt is made to seek a relationship between origin destination demands and some socio-economic and supply characteristics of the cities involved.

##### Origin Destination Patterns

1974 origin destination flows between Atlanta and the 72 cities in the study region are shown in Figures 4-1 through 4-5 and summarized on

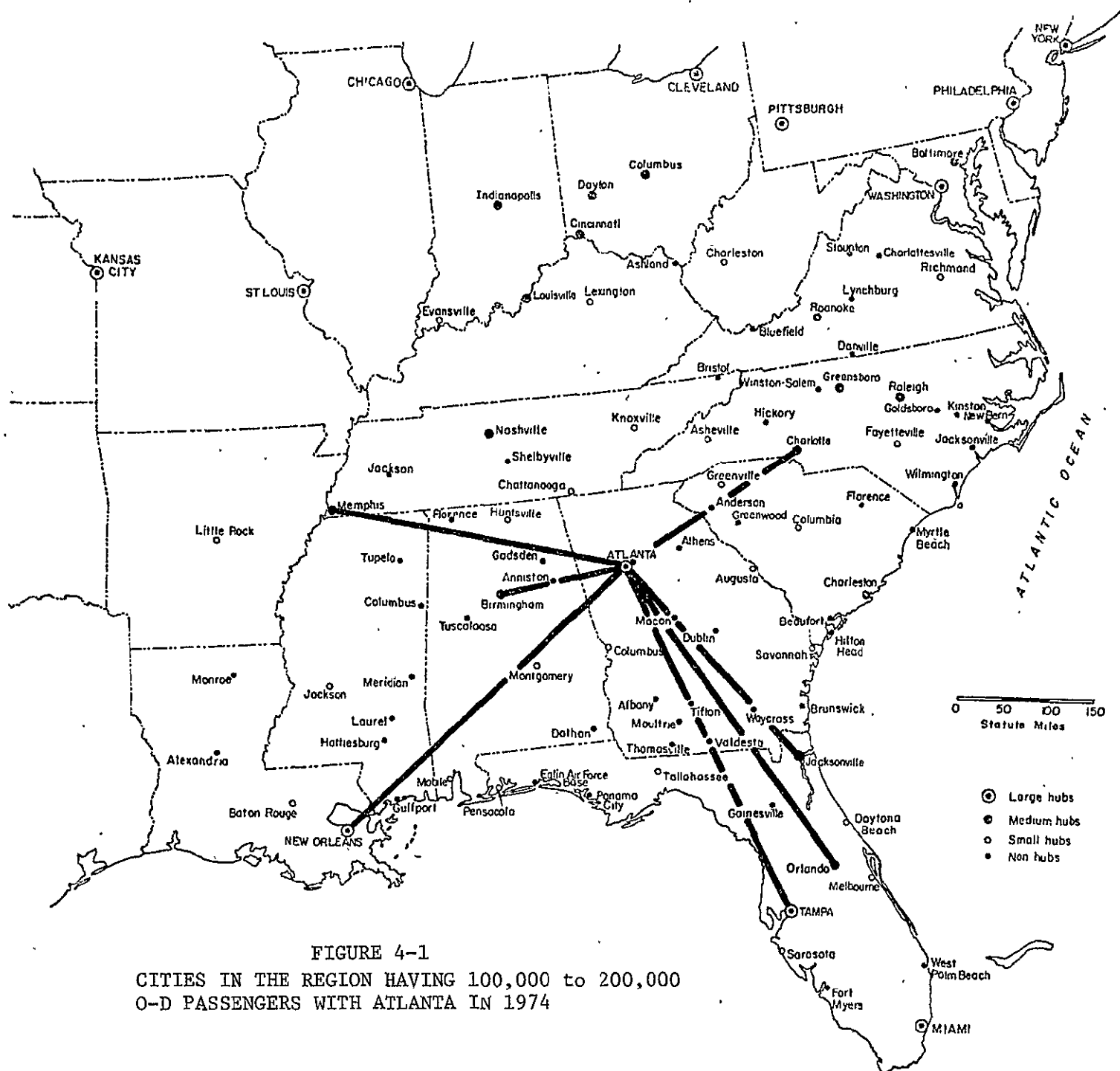


FIGURE 4-1  
CITIES IN THE REGION HAVING 100,000 to 200,000  
O-D PASSENGERS WITH ATLANTA IN 1974

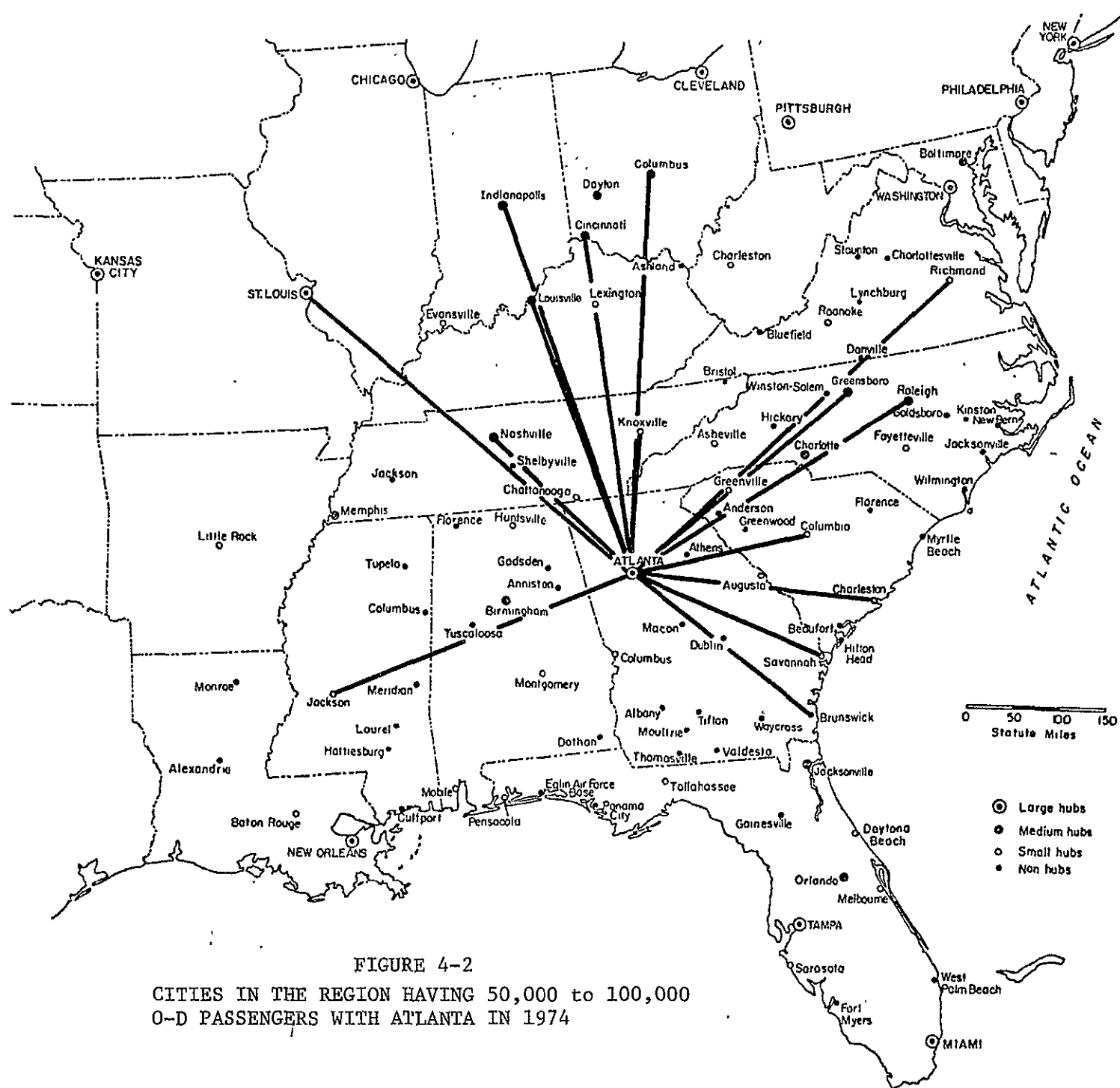


FIGURE 4-2  
CITIES IN THE REGION HAVING 50,000 to 100,000  
O-D PASSENGERS WITH ATLANTA IN 1974

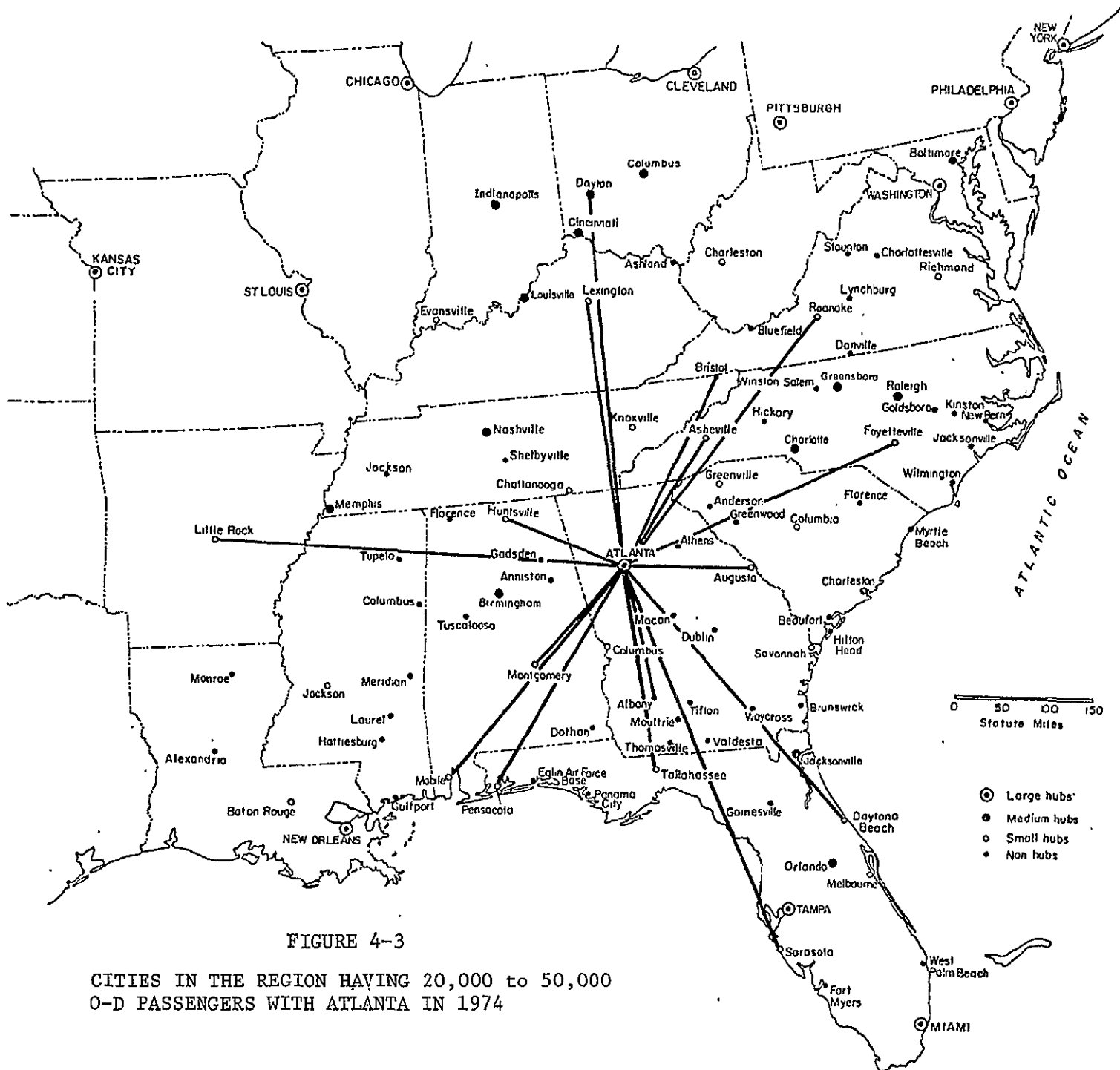


FIGURE 4-3

CITIES IN THE REGION HAVING 20,000 to 50,000  
O-D PASSENGERS WITH ATLANTA IN 1974

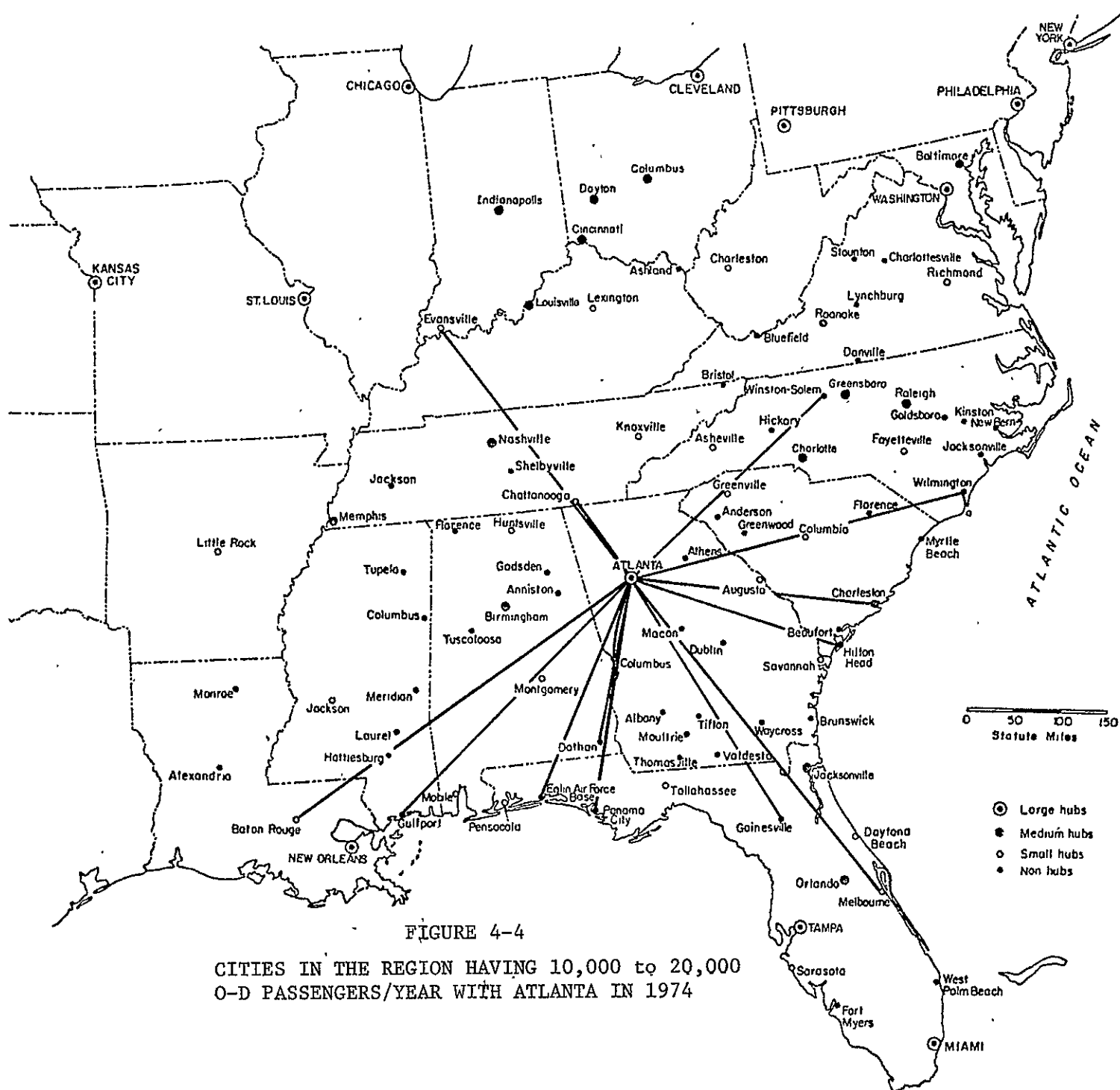


FIGURE 4-4

CITIES IN THE REGION HAVING 10,000 to 20,000  
O-D PASSENGERS/YEAR WITH ATLANTA IN 1974

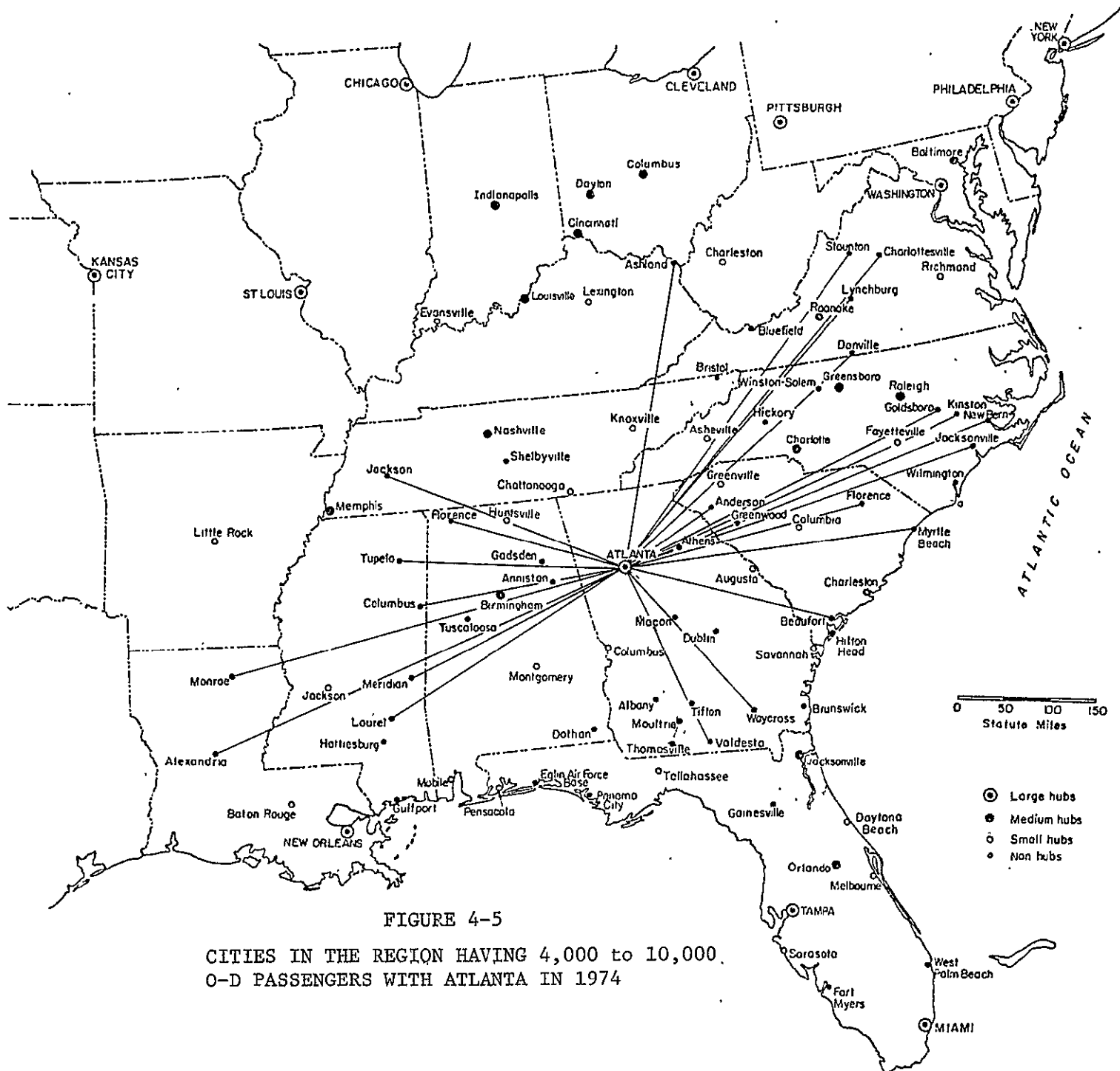


FIGURE 4-5

CITIES IN THE REGION HAVING 4,000 to 10,000  
O-D PASSENGERS WITH ATLANTA IN 1974

Tables 4-1 and 4-2. The data is stratified in groups on the basis of the magnitude of the traffic volumes. It is seen that there are 7 cities with O-D traffic in excess of 100,000. These cities, of which three are in Florida, constitute 33% of the total for the region. Figure 4-1 shows the geographic concentration of these cities to the South and West of Atlanta. In contrast, the 15 cities with O-D traffic between 50,000 and 100,000 are concentrated mostly to the North and East. As the volume level drops, the cities appear to be more evenly distributed geographically around Atlanta, except that there is a marked absence of cities in the Northwest sector. Naturally, this must be related to the distribution of the cities themselves. But, it can also be affected by the fact that cities in the northwestern sector may interact with St. Louis and Chicago thus reducing their demand for travel to Atlanta. Despite the presence of a number of major cities in the Northeast such as Pittsburgh and Washington, there is quite a number of smaller cities in that sector with sizable origin destination traffic with Atlanta.

As Figure 4-6 shows, there is a strong tendency towards concentration of the origin destination traffic to a few larger cities. Close to 80% of the traffic in the region is generated by 22 cities.

It seems natural to expect that origin destination traffic be related to hub size. The correlation between traffic and hub size can be seen visually in Table 4-2.

#### Correlation of Traffic with City Size

In a first attempt to relate origin destination traffic to city socio-economic characteristics, a correlation analysis is performed. This correlation analysis attempts to relate traffic to city population,

ATLANTA ORIGIN-DESTINATION TRAFFIC FOR ALL CITIES  
COMPARED WITH POPULATION AND DISTANCE FROM ATLANTA

| City, State       | Distance to<br>Atlanta<br>(miles) | 1970<br>Population<br>(thousands) | O-D Traffic<br>with Atlanta<br>in 1974 | % of<br>Total<br>for all Cities |
|-------------------|-----------------------------------|-----------------------------------|----------------------------------------|---------------------------------|
| Tampa, FL         | 412                               | 1013                              | 194,270                                | 6.7%                            |
| Jacksonville, FL  | 247                               | 529                               | 148,650                                | 5.1                             |
| Orlando, FL       | 400                               | 428                               | 139,150                                | 4.8                             |
| Memphis, TN       | 332                               | 770                               | 133,180                                | 4.6                             |
| Charlotte, NC     | 227                               | 409                               | 128,920                                | 4.5                             |
| New Orleans, LA   | 425                               | 1046                              | 121,560                                | 4.2                             |
| Birmingham, AL    | 134                               | 739                               | 103,290                                | 3.6                             |
| Nashville, TN     | 214                               | 541                               | 99,790                                 | 3.4                             |
| Raleigh, NC       | 356                               | 228                               | 94,010                                 | 3.2                             |
| Savannah, GA      | 215                               | 188                               | 92,750                                 | 3.2                             |
| St. Louis, MO     | 484                               | 2363                              | 78,030                                 | 2.7                             |
| Louisville, KY    | 321                               | 827                               | 75,920                                 | 2.6                             |
| Columbia, SC      | 192                               | 323                               | 72,640                                 | 2.5                             |
| Greensboro, NC    | 306                               | 604                               | 71,440                                 | 2.5                             |
| Jackson, MS       | 341                               | 259                               | 62,220                                 | 2.1                             |
| Richmond, VA      | 481                               | 518                               | 59,420                                 | 2.0                             |
| Cincinnati, OH    | 373                               | 1385                              | 59,050                                 | 2.0                             |
| Brunswick, GA     | 247                               | 20                                | 58,780                                 | 2.0                             |
| Indianapolis, IN  | 432                               | 1110                              | 55,740                                 | 1.9                             |
| Knoxville, TN     | 152                               | 400                               | 54,930                                 | 1.9                             |
| Charleston, SC    | 259                               | 304                               | 51,230                                 | 1.8                             |
| Columbus, OH      | 446                               | 916                               | 50,650                                 | 1.7                             |
| Mobile, AL        | 302                               | 377                               | 49,760                                 | 1.7                             |
| Dayton, OH        | 432                               | 850                               | 40,550                                 | 1.4                             |
| Tallahassee, FL   | 223                               | 103                               | 38,610                                 | 1.3                             |
| Pensacola, FL     | 272                               | 243                               | 35,990                                 | 1.2                             |
| Daytona Beach, FL | 366                               | 45                                | 35,220                                 | 1.2                             |
| Montgomery, AL    | 147                               | 201                               | 34,170                                 | 1.2                             |
| Huntsville, AL    | 151                               | 228                               | 33,130                                 | 1.1                             |
| Bristol, TN       | 227                               | 20                                | 29,740                                 | 1.0                             |
| Lexington, KY     | 303                               | 174                               | 28,660                                 | .99                             |
| Sarasota, FL      | 444                               | 40                                | 28,410                                 | .98                             |
| Roanoke, VA       | 357                               | 181                               | 27,660                                 | .96                             |
| Greenville, SC    | 154                               | 300                               | 27,120                                 | .94                             |
| Augusta, GA       | 143                               | 253                               | 26,920                                 | .93                             |
| Fayetteville, NC  | 330                               | 212                               | 24,850                                 | .86                             |
| Little Rock, AR   | 453                               | 323                               | 23,360                                 | .81                             |
| Asheville, NC     | 164                               | 145                               | 21,490                                 | .74                             |
| Albany, GA        | 146                               | 90                                | 20,880                                 | .72                             |
| Baton Rouge, LA   | 449                               | 285                               | 18,840                                 | .65                             |
| Columbus, GA      | 83                                | 239                               | 18,760                                 | .65                             |
| Panama City, FL   | 247                               | 32                                | 18,500                                 | .64                             |
| Melbourne, FL     | 443                               | 40                                | 18,340                                 | .63                             |



TABLE 4-1 (continued)

| City, State         | Distance to<br>Atlanta<br>(miles) | 1970<br>Population<br>(thousands) | O-D Traffic<br>with Atlanta<br>in 1974 | % of<br>Total<br>for all Cities |
|---------------------|-----------------------------------|-----------------------------------|----------------------------------------|---------------------------------|
| Gainesville, FL     | 300                               | 105                               | 18,280                                 | .63                             |
| Charleston, WV      | 363                               | 229                               | 17,520                                 | .61                             |
| Chattanooga, TN     | 106                               | 305                               | 17,440                                 | .60                             |
| Dothan, AL          | 171                               | 37                                | 16,240                                 | .56                             |
| Wilmington, NC      | 377                               | 107                               | 16,200                                 | .56                             |
| Eglin A.F.B., FL    | 250                               | 8                                 | 16,050                                 | .55                             |
| Hilton Head, SC     | 239                               |                                   | 15,850                                 | .55                             |
| Winston Salem, NC   | 294                               | 133                               | 12,610                                 | .44                             |
| Gulfport, MS        | 352                               | 135                               | 11,760                                 | .41                             |
| Evansville, IN      | 350                               | 233                               | 10,930                                 | .38                             |
| Florence, SC        | 273                               | 26                                | 9,770                                  | .34                             |
| Tuscaloosa, AL      | 186                               | 116                               | 9,770                                  | .34                             |
| Myrtle Beach, SC    | 329                               | 9                                 | 9,410                                  | .33                             |
| Kinston, NC         | 406                               | 22                                | 8,950                                  | .31                             |
| Waycross, GA        | 203                               | 19                                | 8,720                                  | .30                             |
| Monroe, LA          | 448                               | 115                               | 8,270                                  | .29                             |
| Meridan, MS         | 267                               | 45                                | 7,540                                  | .26                             |
| Columbus, MS        | 241                               | 26                                | 7,430                                  | .26                             |
| Macon, GA           | 79                                | 206                               | 7,270                                  | .25                             |
| Valdosta, GA        | 208                               | 32                                | 7,000                                  | .24                             |
| Muscle Shoals, AL   | 198                               | 34                                | 6,950                                  | .24                             |
| Alexandria, LA      | 485                               | 42                                | 6,850                                  | .24                             |
| Lynchburg, VA       | 389                               | 123                               | 6,200                                  | .21                             |
| Hickory, NC         | 225                               | 21                                | 5,800                                  | .20                             |
| Charlottesville, VA | 457                               | 39                                | 5,350                                  | .18                             |
| Jacksonville, NC    | 407                               | 16                                | 5,170                                  | .18                             |
| Beaufort, SC        | 229                               | 9                                 | 4,760                                  | .17                             |
| Ashland, KY         | 342                               | 29                                | 4,370                                  | .15                             |
| New Bern, NC        | 442                               | 15                                | 4,030                                  | .14                             |
| TOTAL               |                                   |                                   | 2,894,100                              |                                 |

TABLE 4-2  
SUMMARY OF ORIGIN-DESTINATION TRAFFIC DATA ON FIGURE 4-1 TO 4-5

| FIGURE | RANGE OF<br>O-D PASSENGERS | NUMBER<br>OF<br>CITIES | CONTRIBUTION<br>TO TOTAL O-D<br>TRAFFIC | HUB<br>SIZES                     | COMMENTS                                                                                    |
|--------|----------------------------|------------------------|-----------------------------------------|----------------------------------|---------------------------------------------------------------------------------------------|
| 4-1    | 100,000-200,000            | 7                      | .33%                                    | L - 2<br>M - 5                   | Three of these cities are in Florida.                                                       |
| 4-2    | 50,000-100,000             | 15                     | 36%                                     | L - 1<br>M - 8<br>S - 6<br>N - 1 | The large hub is St. Louis, MO<br><br>The non-hub is Brunswick, GA.                         |
| 4-3    | 20,000-50,000              | 16                     | 18%                                     | M - 1<br>S - 13<br>N - 1         | The medium hub is Dayton, OH<br><br>The non-hub is Bristol, TN                              |
| 4-4    | 10,000-20,000              | 13                     | 8%                                      | S - 4<br>N - 9                   | The small hubs are:<br>Baton Rouge, LA<br>Evansville, IN<br>Charleston, SC<br>Melbourne, FL |
| 4-5    | 4,000-10,000               | 21                     | 5%                                      | N - 21                           |                                                                                             |

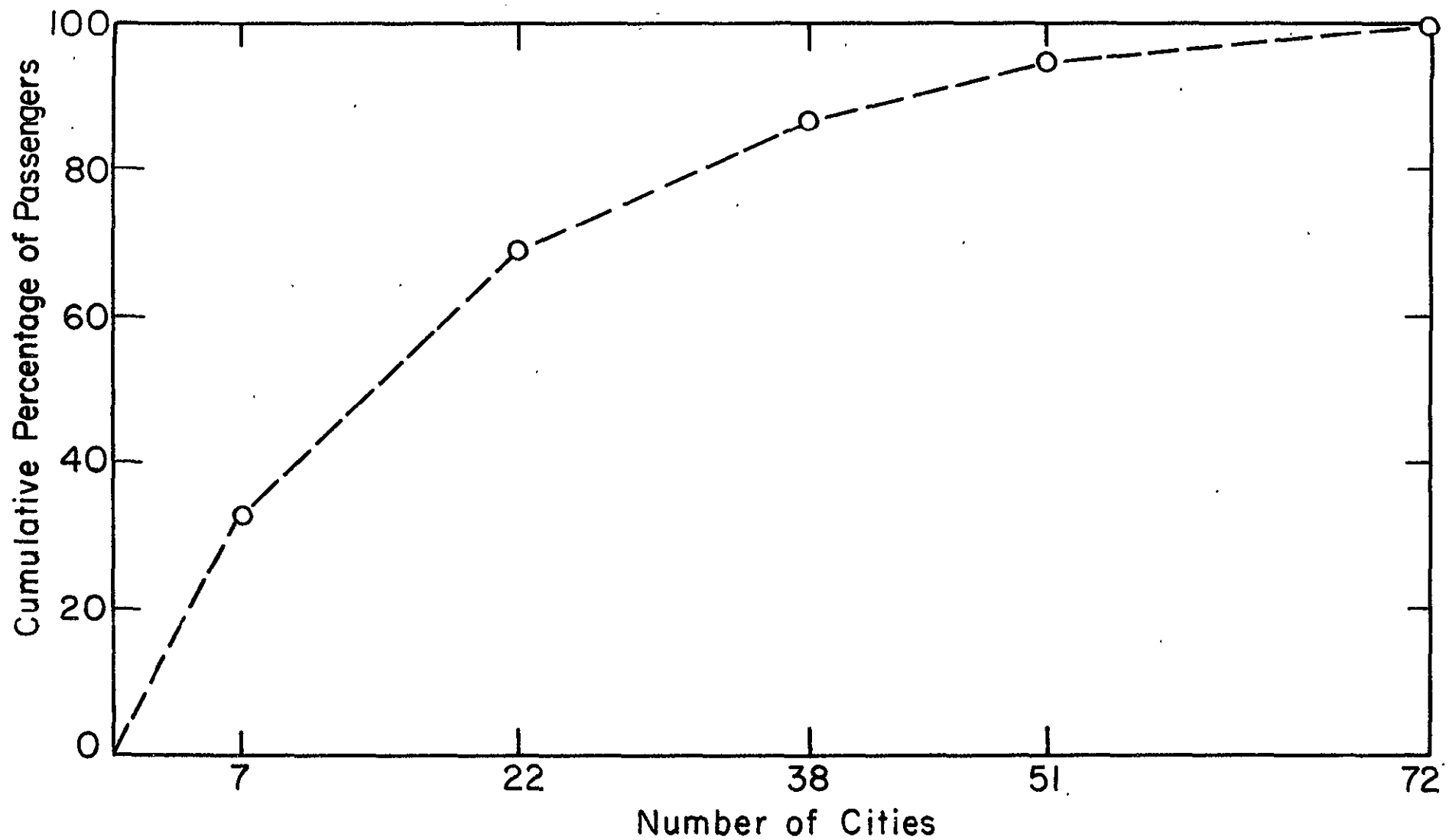


FIG.4-6 DISTRIBUTION OF PERCENTAGE OF O-D TRAFFIC WITH ATLANTA  
FOR ALL CITIES

hub size, and distance from Atlanta. Given the geographic features of the origin destination patterns observed in Figures 4-1 through 4-5, it was decided to perform the correlation analysis on a sector by sector basis, as well as for the whole region. Table 4-3 shows the results of this analysis. The salient result is that hub size, or population are strongly correlated with origin destination traffic whereas distance is not. However, an important feature of these results is that distinct differences exist between the different sectors. This feature, already visible on Figures 4-1 through 4-5, warrants further analysis.

|            | All Sectors | Northeast | Northwest | Southeast | Southwest |
|------------|-------------|-----------|-----------|-----------|-----------|
| Population | 0.583       | 0.75      | 0.48      | 0.88      | 0.95      |
| Distance   | 0.07        | 0.26      | 0.13      | 0.33      | 0.04      |
| Hub Size   | 0.82        | 0.88      | 0.68      | 0.88      | 0.94      |

TABLE 4-3 CORRELATIONS OF O-D TRAFFIC AND CITY SIZE

#### Correlation of Traffic and Service Patterns

In order to relate origin destination traffic and air service patterns in the Atlanta region, a summary is made of the air service connections between Atlanta and the 72 cities considered. Tables 4-4 and 4-5 and Figures 4-7 through 4-10 show the service patterns described in terms of flight frequencies, and numbers of available seats in each connection. These figures include all service connections with non-stop and direct flights with stops.

The characterization of service frequencies is made with the following stratification:

High Frequency: More than 7 direct flights a day in one direction  
 Medium Frequency: 3-7 direct flights a day,  
 Low Frequency: 2 or less direct flights a day.

## DIRECT FLIGHTS BETWEEN ATLANTA AND ALL

SHORT HAUL CITIES IN THE STUDY<sup>(1)</sup>

| City                                       | Airport Code | Hub Size | Total # of flights | Non-stop flights % of total | Estimated # of passenger seats |
|--------------------------------------------|--------------|----------|--------------------|-----------------------------|--------------------------------|
| More than 7 flights/day inbound at Atlanta |              |          |                    |                             |                                |
| Augusta, GA                                | AGS          | S        | 145                | 100                         | 11220                          |
| Birmingham, AL                             | BHM          | M        | 249                | 100                         | 22439                          |
| Charleston, SC                             | CHS          | S        | 112                | 37                          | 9016                           |
| Charlotte, NC                              | CLT          | M        | 182                | 88                          | 15701                          |
| Chattanooga, TN                            | CHA          | S        | 124                | 100                         | 7693                           |
| Cincinnati, OH                             | CVG          | M        | 188                | 48                          | 18274                          |
| Columbia, SC                               | CAE          | S        | 146                | 72                          | 14031                          |
| Columbus, OH                               | CMH          | M        | 126                | 28                          | 13104                          |
| Columbus, GA                               | CSG          | S        | 161                | 100                         | 8246                           |
| Indianapolis, IN                           | IND          | M        | 154                | 54                          | 13902                          |
| Jackson, MS                                | JAN          | S        | 161                | 35                          | 14567                          |
| Jacksonville, FL                           | JAX          | M        | 206                | 95                          | 28077                          |
| Knoxville, TN                              | TYS          | S        | 119                | 76                          | 8911                           |
| Louisville, KY                             | SDF          | M        | 175                | 84                          | 15792                          |
| Memphis, TN                                | MEM          | M        | 231                | 67                          | 24640                          |
| Mobile, AL                                 | MOB          | S        | 133                | 74                          | 7448                           |
| Montgomery, AL                             | MGM          | S        | 168                | 87                          | 10157                          |
| Nashville, TN                              | BNA          | M        | 112                | 94                          | 7770                           |
| New Orleans, LA                            | MSY          | L        | 273                | 64                          | 25144                          |
| Orlando, FL                                | MCO          | M        | 182                | 92                          | 30569                          |
| St. Louis, MO                              | STL          | L        | 147                | 86                          | 15722                          |
| Savannah, GA                               | SAV          | S        | 133                | 74                          | 11060                          |
| Tampa, FL                                  | TPA          | L        | 273                | 92                          | 41608                          |
| 3 to 7 flight/day inbound at Atlanta       |              |          |                    |                             |                                |
| Albany, GA                                 | ABY          | N        | 64                 | 100                         | 2898                           |
| Asheville, NC                              | AVL          | S        | 95                 | 100                         | 10140                          |
| Baton Rouge, LA                            | BTR          | S        | 42                 | 67                          | 2352                           |
| Bristol, TN                                | TRI          | N        | 80                 | 82                          | 6615                           |
| Brunswick, GA                              | SSI          | N        | *80                | 42                          | 3246                           |
| Charleston, WV                             | CRW          | S        | 48                 | 44                          | 5310                           |
| Dayton, OH                                 | DAY          | M        | 91                 | 92                          | 7210                           |
| Daytona Beach, FL                          | DAB          | S        | 91                 | 61                          | 10339                          |
| Dothan, AL                                 | DHN          | N        | 70                 | 80                          | 3794                           |
| Eglin A.F. Base, FL                        | VPS          | N        | 70                 | 20                          | 3920                           |
| Fayetteville, NC                           | FAY          | S        | 75                 | 81                          | 9000                           |
| Florence, SC                               | FLO          | N        | 42                 | 100                         | 3300                           |
| Gainesville, FL                            | GNV          | N        | 42                 | 100                         | 2352                           |
| Greensboro, NC                             | GSO          | M        | 77                 | 100                         | 8057                           |
| Greenville, SC                             | GSP          | S        | 98                 | 93                          | 10122                          |
| Gulfport, MS                               | GPT          | N        | 56                 | 0                           | 3136                           |
| Hilton Head Isl., SC                       | HHH          | N        | *47                | 74                          | 1511                           |
| Huntsville, AL                             | HSV          | S        | 75                 | 81                          | 4074                           |
| Kinston, NC                                | ISO          | N        | 48                 | 14                          | 4500                           |
| Lexington, KY                              | LEX          | S        | 70                 | 44                          | 4669                           |
| Macon, GA                                  | MCN          | N        | 98                 | 100                         | 5488                           |
| Melbourne, FL                              | MLB          | S        | 63                 | 67                          | 9520                           |

TABLE 4- 4 (continued)

| City                                       | Airport Code | Hub Size | Total # of flights | Non-Stop flights % of total | Estimated # of passenger seats |
|--------------------------------------------|--------------|----------|--------------------|-----------------------------|--------------------------------|
| Monroe, LA                                 | MLU          | N        | 49                 | 14                          | 3493                           |
| Panama City, FL                            | PFN          | N        | 56                 | 25                          | 3136                           |
| Pensacola, FL                              | PNS          | S        | 91                 | 54                          | 8092                           |
| Raleigh, NC                                | RDU          | M        | 91                 | 85                          | 9702                           |
| Richmond, VA                               | RIC          | S        | 56                 | 100                         | 8379                           |
| Roanoke, VA                                | ROA          | S        | 83                 | 17                          | 9120                           |
| Sarasota, FL                               | SRQ          | S        | 49                 | 100                         | 7238                           |
| Tallahassee, FL                            | TLH          | S        | 84                 | 83                          | 9198                           |
| Tuscaloosa, AL                             | TCL          | N        | 47                 | 85                          | 2380                           |
| Wilmington, NC                             | ILM          | N        | 48                 | 71                          | 5661                           |
| Winston Salem, NC                          | INT          | N        | 54                 | 13                          | 4755                           |
| Less than 3 flights/day inbound at Atlanta |              |          |                    |                             |                                |
| Alexandria, LA                             | ESF          | N        | 35                 | 0                           | 1960                           |
| Ashland, KY                                | HTS          | N        | 13                 | 0                           | 585                            |
| Beaufort, SC                               | BFT          | N        | *26                | 0                           | 390                            |
| Charlottesville, VA                        | CHO          | N        | 28                 | 0                           | 2835                           |
| Columbus, MS                               | GTR          | N        | 40                 | 0                           | 1862                           |
| Evansville, IN                             | EVV          | S        | 14                 | 100                         | 2282                           |
| Hickory, NC                                | HKY          | N        | 34                 | 79                          | 1830                           |
| Jacksonville, NC                           | OAJ          | N        | 33                 | 61                          | 3540                           |
| Little Rock, AR                            | LIT          | S        | 14                 | 0                           | 1232                           |
| Lynchburg, VA                              | LYH          | N        | 34                 | 0                           | 3030                           |
| Meridian, MS                               | MEI          | N        | 40                 | 35                          | 2240                           |
| Muscle Shoals, AL                          | MSL          | N        | 28                 | 0                           | 1568                           |
| Myrtle Beach, SC                           | CRE          | N        | 41                 | 34                          | 2460                           |
| New Bern, NC                               | EWN          | N        | 28                 | 0                           | 1680                           |
| Valdosta, GA                               | VLD          | N        | 40                 | 15                          | 1520                           |
| Waycross, GA                               | AYS          | N        | *27                | 100                         | 1242                           |

(1) Data is taken from the Official Airline Guide, September 1974.  
 Figures are weekly and for both directions.

\* Commuter Air Carrier.

TABLE 4-5  
SUMMARY OF SERVICE DATA ON FIGURES 4-7 TO 4-10

| FIGURE | FREQUENCY | NUMBER<br>OF<br>CITIES | HUB<br>SIZE                        | COMMENTS                                                            |
|--------|-----------|------------------------|------------------------------------|---------------------------------------------------------------------|
| 4-7    | All       | 72                     |                                    |                                                                     |
| 4-8    | High      | 23                     | L - 3<br>M - 10<br>S - 10<br>N - 0 |                                                                     |
| 4-9    | Medium    | 33                     | L - 0<br>M - 3<br>S - 14<br>N - 16 | The medium hubs are:<br>Dayton, OH<br>Greensboro, NC<br>Raleigh, NC |
| 4-10   | Low       | 16                     | L - 0<br>M - 0<br>S - 2<br>N - 14  | The small hubs are:<br>Little Rock, AR<br>Evansville, IN            |

ORIGINAL PAGE IS  
OF POOR QUALITY

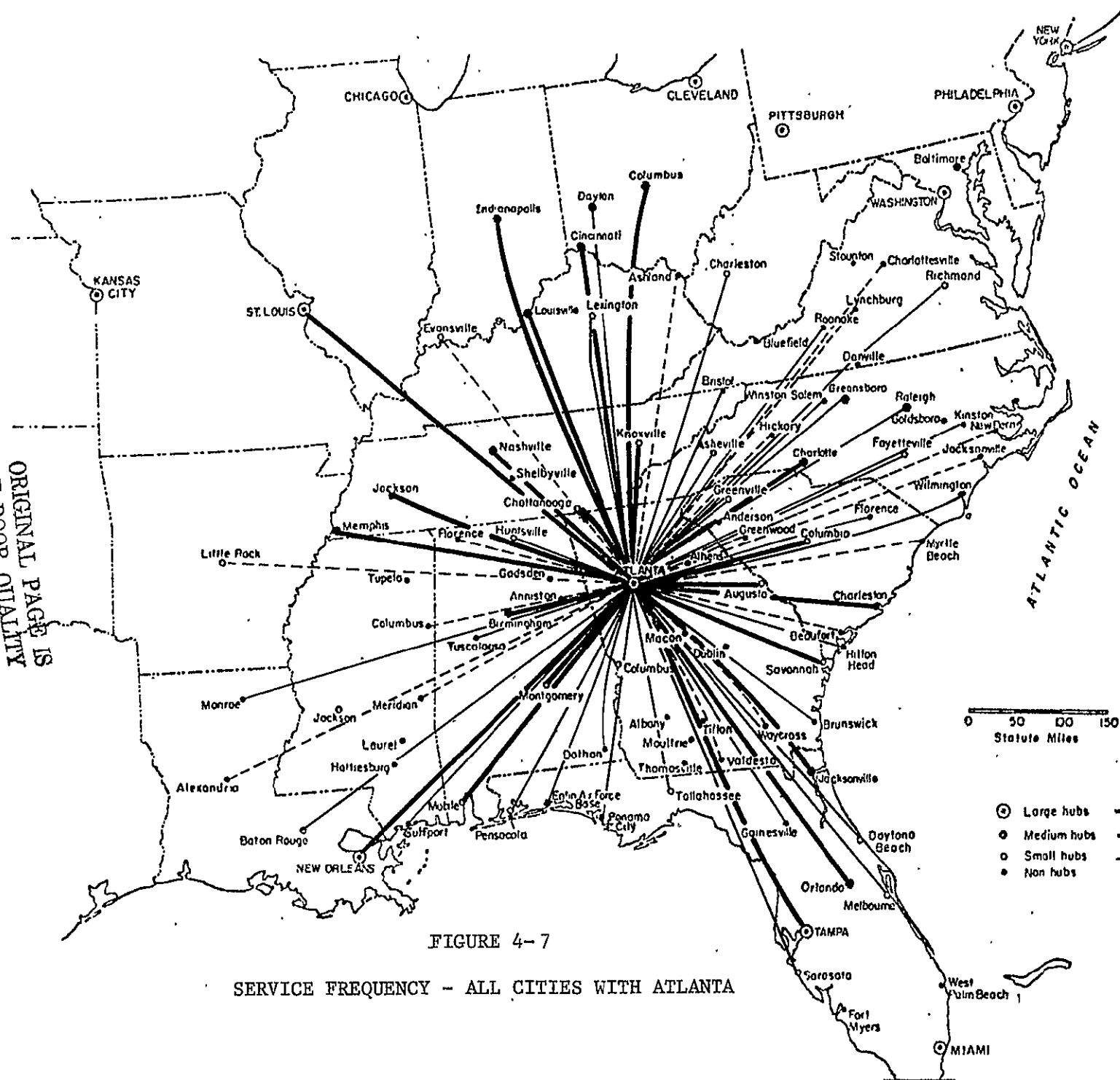


FIGURE 4-7

SERVICE FREQUENCY - ALL CITIES WITH ATLANTA



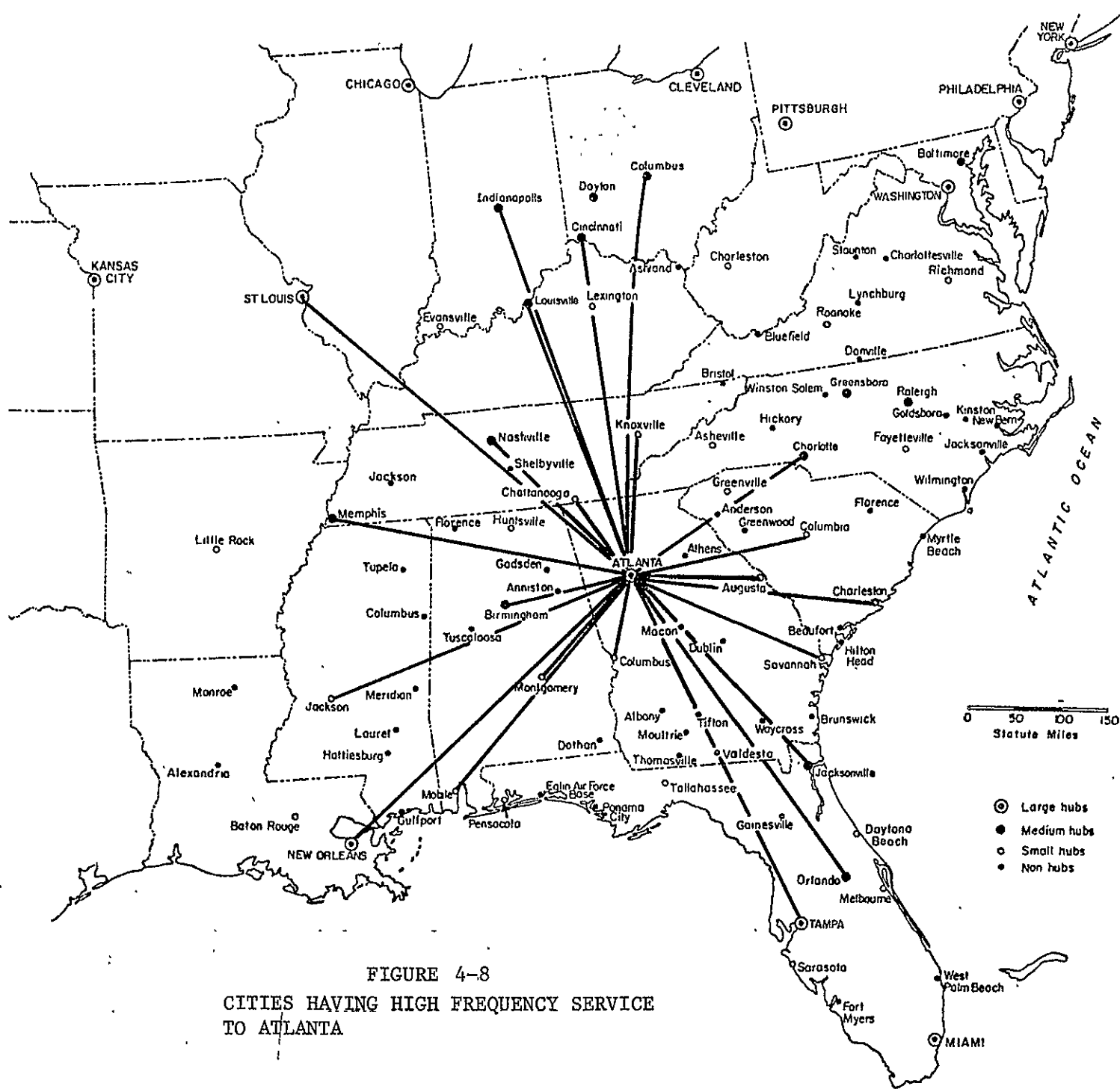


FIGURE 4-8  
CITIES HAVING HIGH FREQUENCY SERVICE  
TO ATLANTA

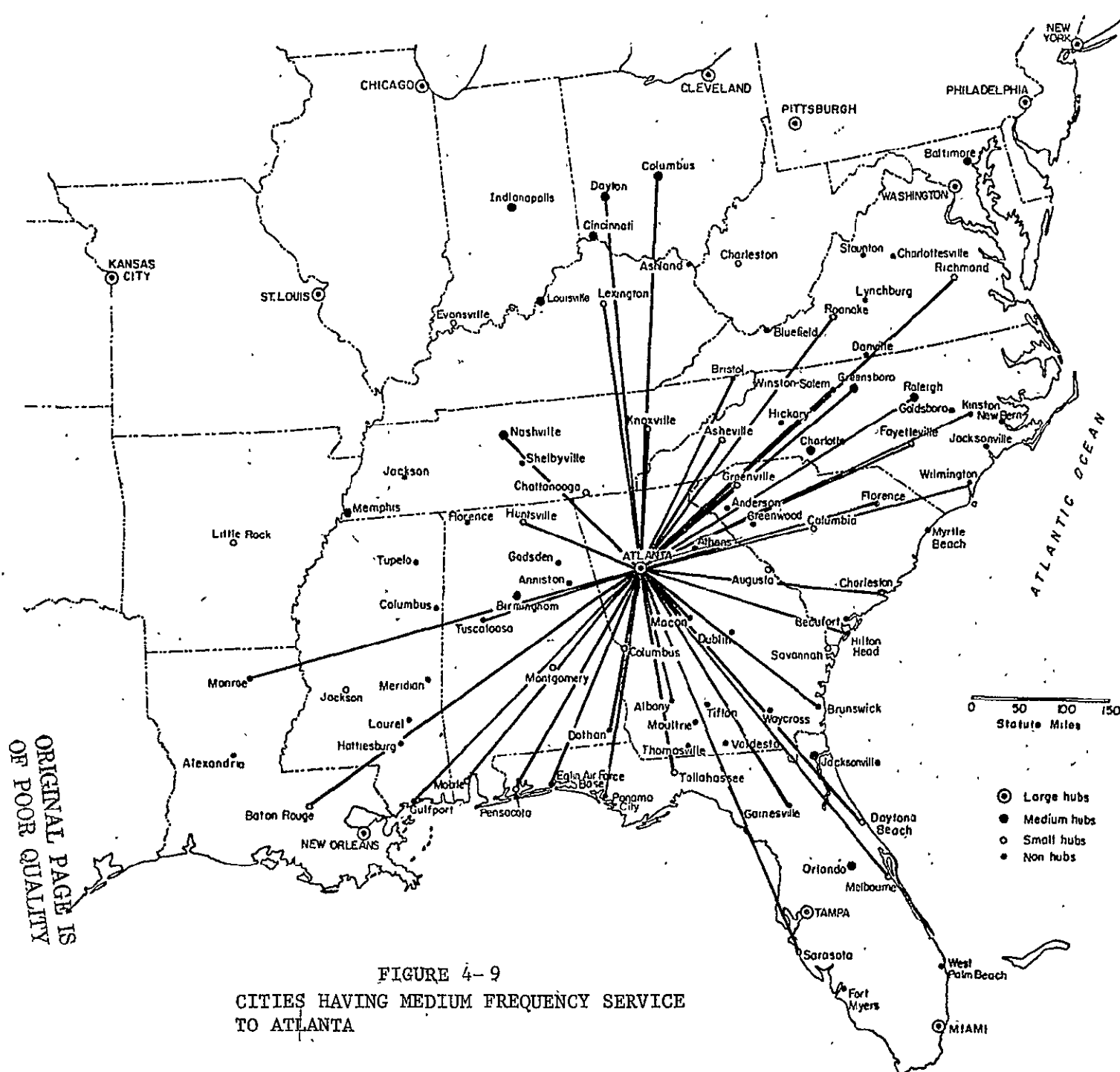


FIGURE 4-9  
CITIES HAVING MEDIUM FREQUENCY SERVICE  
TO ATLANTA

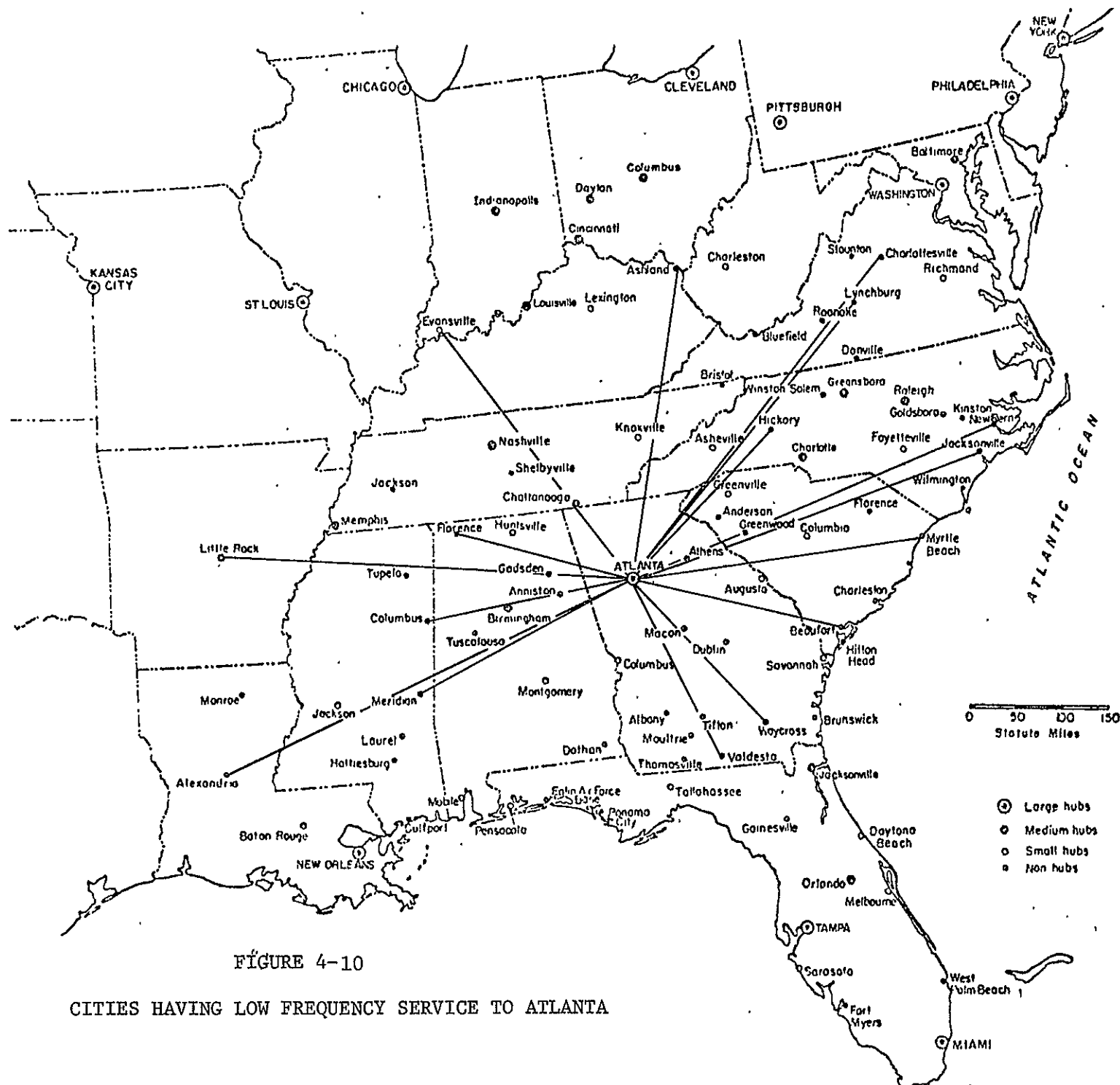


FIGURE 4-10

CITIES HAVING LOW FREQUENCY SERVICE TO ATLANTA

By compiling data on aircraft types used in each of the services in the region, it is possible to convert service frequencies into numbers of total available seats. A comparison of available seats and O-D traffic is shown in Figure 4-11. As expected, large variations exist between the numbers of available seats and the O-D volumes. This is due to the fact that the available seats serve traffic other than O-D traffic. These variations are most likely to be explained by variations in the proportions of connecting and through trips on each link. However, if anything, this comparison would indicate initially that O-D traffic is not likely to be constrained by the lack of capacity in this region. A more detailed analysis of traffic other than O-D follows in a later chapter.

In an attempt to quantify the relationships between O-D volumes and service patterns, a correlation analysis is performed. It relates O-D volumes to total available seats and to the percentage of non-stop flights serving each city. The results of this correlation are shown in Table 4-6. Unlike the relationship between O-D traffic and hub size, there seems to be no significant geographic differences in the correlations. Strong correlations exist between traffic and frequency, or available seats. The percentage of non-stop flights in the market does not seem to correlate strongly with traffic volume.

|            | All Sectors | Northeast | Northwest | Southeast | Southwest |
|------------|-------------|-----------|-----------|-----------|-----------|
| Frequency  | 0.84        | 0.85      | 0.80      | 0.77      | 0.95      |
| Seats      | 0.91        | 0.84      | 0.81      | 0.96      | 0.97      |
| %-Non-stop | 0.40        | 0.58      | 0.20      | 0.15      | 0.49      |

TABLE 4-6 CORRELATIONS OF O-D TRAFFIC AND SERVICE CHARACTERISTICS

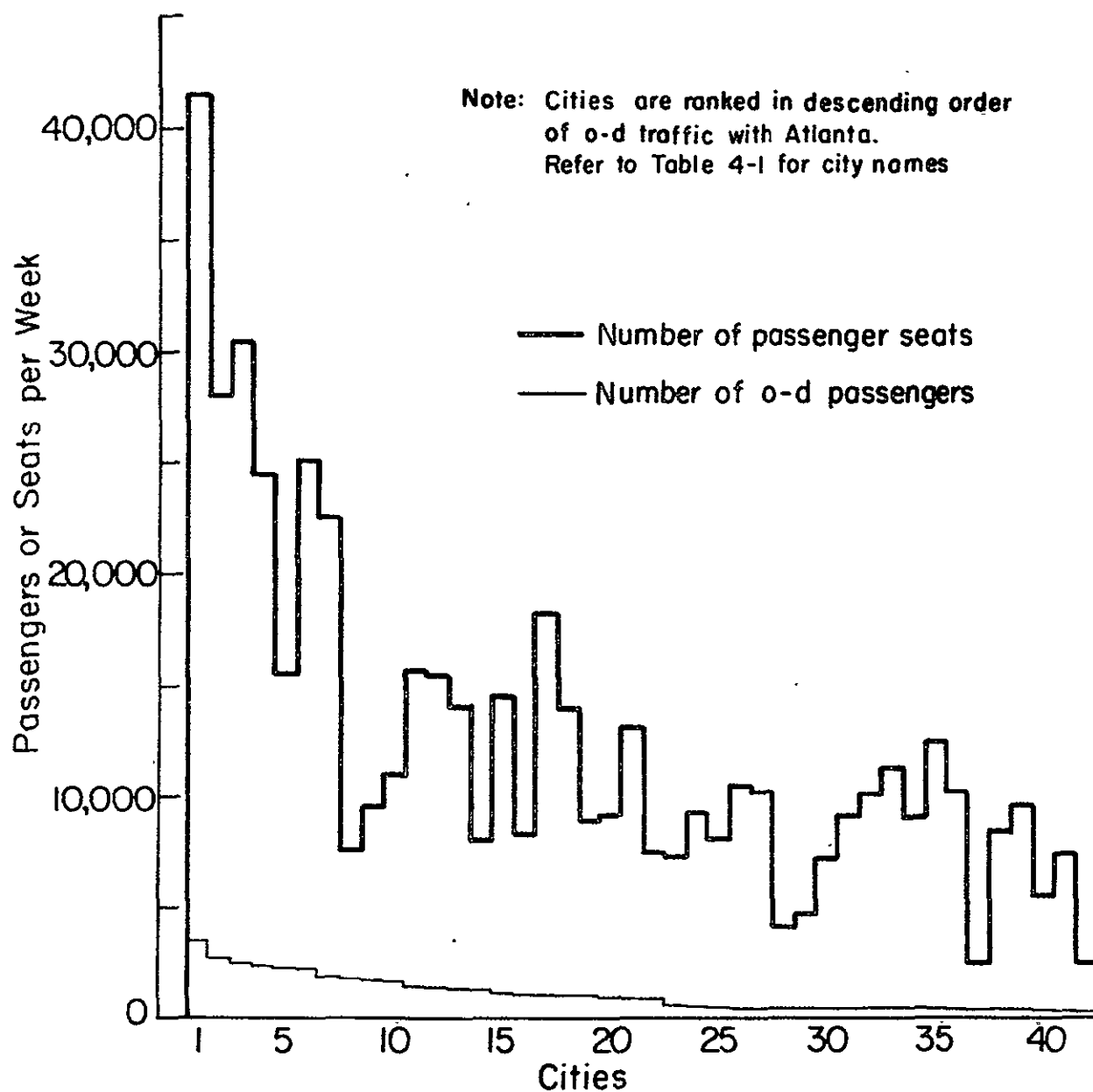


FIG. 4-II ORIGIN-DESTINATION TRAFFIC COMPARED WITH AVAILABLE SEATS FOR LARGE, MEDIUM AND SMALL HUBS

### Summary

The characterization of O-D traffic patterns indicates that significant differences exist between the demand characteristics of different sectors. Cities in the North generally generate less traffic than comparable cities in the south. This may be due to alternative regional centers to Atlanta of which there are more in the north than in the south. This indicates the desirability of stratifying further work in the study region by sector.

Strong correlation exists between traffic volumes and the available service capacity and frequency. The causal relationship between these two is likely to be two way. However, it appears that differences in through and connecting traffic volume may account for the difference in the generally low ratios of traffic to available capacity. A look at connecting traffic patterns is the subject of the next chapter.

## 5. ATLANTA SHORT HAUL TRAFFIC PATTERNS

### Introduction

This chapter is concerned with the traffic patterns of all the short haul air traffic between Atlanta and the cities in the Study Area. In addition to origin destination traffic discussed in the previous chapter, there are two other categories: connecting traffic and through traffic.

In order to clarify the definitions of these groups, Figure 5-1 is presented. It shows that origin destination traffic between two cities A and B originates in one and is destined to the other. Connecting traffic is where a passenger originates from, or is destined to one of the two cities, but makes a connection at the other city to yet another flight. Through traffic is when a passenger travelling between the cities neither originates nor terminates the journey in either of the cities. It is possible to further subdivide each of these groups into direct and indirect traffic. Direct traffic is where passengers continue on the same flight with or without stops throughout the air journey between A and B and indirect traffic is where a change of flight occurs.

This study is limited at this stage to origin destination and to connecting traffic. The limitation of the scope by excluding through traffic was necessitated by the added difficulty of acquiring service segment data necessary to identify the exact itineraries of passengers and to obtain through traffic figures.<sup>(1)</sup> As shown in Figure 5-1, connecting traffic is divided into two groups, connections between short haul flights to destinations within the region, and connections between such flights and long haul flights to the outside of the region. The importance of this distinction stems from

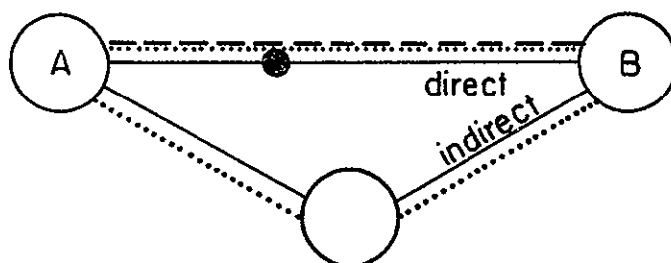
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(1) See Chapter 6 or Appendix II for a further discussion of through traffic.

FIGURE 5-1

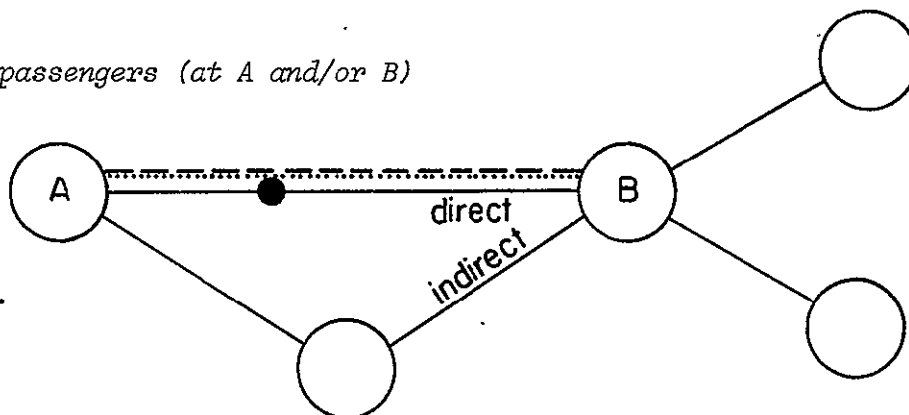
BREAKDOWN OF AIR PASSENGER TRAVEL  
BETWEEN TWO CITIES

1. *Origin-Destination passengers*



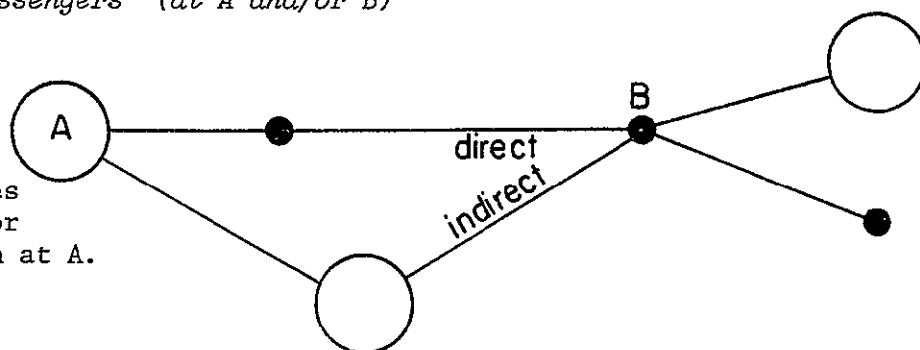
2. *Connecting passengers (at A and/or B)*

Passenger  
begins or  
ends a journey,  
or makes a  
connection at A.



3. *Through passengers (at A and/or B)*

Passenger  
begins or ends  
a journey, makes  
a connection, or  
travels through at A.



NOTES:

○ A hub at which the passenger makes a connection, or begins or ends a journey.

● A hub where the airline flight stops but the passenger remains on the same flight.

— — — "coupon passengers".

..... data obtained.



the interest in the implication for dedicated short haul systems, including a short haul airport, e.g. at Atlanta. Data for this chapter are compiled for the 72 cities with certificated air service and the 3 cities with commuter service to Atlanta. Data are obtained from the CAB files.<sup>(2)</sup>

#### Data Analysis

Short haul traffic at Atlanta is summarized in Table 5-1. The table shows, in addition to origin destination flows, the short haul, and long haul connecting traffic as defined in the previous section. Short haul connecting traffic is further subdivided into mileage blocks. The distribution of total traffic volumes is shown on Figure 5-2 which shows an expected tendency towards concentration with a few cities constituting the major portion of all short haul traffic. In fact, 15 of the 75 cities in the region account for 50% of all the short haul traffic at Atlanta. These cities are distributed throughout the region as shown in Figure 5-3 although the top three among them are cities in Florida alone.

More detailed analyses are probably in order for these 15 top cities. For this reason, further data documentation is presented for them in Tables 5-2 through 5-4. The distribution of the traffic volumes for these cities are shown in Figure 5-4. It can be seen that invariably, there are more connecting passengers than origin destination passengers flying between these cities and Atlanta. In fact, Table 5-2 shows that the percentage of connecting passengers of the total traffic is at least 51% and typically in the 70% range. The predominance of connecting traffic for the Atlanta cities is interesting although not too surprising as Atlanta appears to act as a gateway for that

<sup>(2)</sup> See Appendix III for the discussion of data access problems.

TABLE 5-1  
SUMMARY OF ALL SHORT HAUL TRAFFIC DATA

| City              | Total <sup>2</sup><br>Pass.<br>to &<br>from<br>Atlanta | O-D <sup>3</sup><br>Pass. <sup>3</sup> | Pass.<br>Orig.<br>or<br>Term. <sup>4</sup><br>at<br>Atlanta<br>only. | Pass.<br>Connect.<br>to<br>Other<br>Flights<br>At<br>Atlanta. | CONNECTING TRAFFIC AT ATLANTA <sup>5</sup>      |                                                  |                                                                             |         |         |         |         |
|-------------------|--------------------------------------------------------|----------------------------------------|----------------------------------------------------------------------|---------------------------------------------------------------|-------------------------------------------------|--------------------------------------------------|-----------------------------------------------------------------------------|---------|---------|---------|---------|
|                   |                                                        |                                        |                                                                      |                                                               | Pass.<br>Connect.<br>to long<br>haul<br>flights | Pass.<br>Connect.<br>to short<br>haul<br>flights | Short Haul Connecting Traffic at Atlanta<br>Subdivided into Mileage Blocks. |         |         |         |         |
|                   |                                                        |                                        |                                                                      |                                                               |                                                 |                                                  | 0-100                                                                       | 100-200 | 200-300 | 300-400 | 400-500 |
| Tampa, FL         | 824,570                                                | 190,600                                | 13,090                                                               | 620,880                                                       | 262,860                                         | 358,020                                          | 8,290                                                                       | 83,140  | 61,180  | 110,460 | 94,950  |
| Orlando, FL       | 781,870                                                | 136,950                                | 7,090                                                                | 637,830                                                       | 366,970                                         | 270,860                                          | 4,650                                                                       | 48,140  | 33,010  | 89,260  | 95,800  |
| Jacksonville, FL  | 633,890                                                | 147,540                                | 8,000                                                                | 478,350                                                       | 276,170                                         | 202,180                                          | 4,400                                                                       | 39,630  | 35,640  | 73,040  | 49,470  |
| New Orleans, LA   | 528,460                                                | 118,500                                | 16,410                                                               | 393,550                                                       | 182,190                                         | 211,360                                          | 4,600                                                                       | 37,230  | 45,370  | 62,550  | 61,610  |
| Birmingham, AL    | 452,760                                                | 103,180                                | 8,840                                                                | 340,740                                                       | 211,790                                         | 128,950                                          | 1,970                                                                       | 21,370  | 29,430  | 33,390  | 42,790  |
| Charlotte, NC     | 393,730                                                | 127,630                                | 15,750                                                               | 250,350                                                       | 112,340                                         | 138,010                                          | 5,740                                                                       | 17,170  | 26,670  | 28,190  | 60,240  |
| Columbia, SC      | 385,820                                                | 72,290                                 | 7,640                                                                | 305,890                                                       | 174,040                                         | 131,850                                          | 10,490                                                                      | 19,800  | 15,980  | 33,590  | 51,990  |
| Memphis, TN       | 383,580                                                | 129,940                                | 56,980                                                               | 196,660                                                       | 61,440                                          | 135,220                                          | 6,980                                                                       | 31,860  | 42,490  | 19,620  | 34,270  |
| Savannah, GA      | 327,790                                                | 92,430                                 | 3,850                                                                | 231,510                                                       | 159,500                                         | 72,010                                           | 2,270                                                                       | 12,950  | 6,510   | 22,510  | 27,770  |
| Louisville, KY    | 281,040                                                | 74,440                                 | 7,180                                                                | 199,420                                                       | 62,150                                          | 137,270                                          | 5,000                                                                       | 27,130  | 39,200  | 18,800  | 47,140  |
| Charleston, SC    | 266,480                                                | 50,690                                 | 2,700                                                                | 213,090                                                       | 119,880                                         | 93,210                                           | 3,900                                                                       | 17,650  | 9,760   | 30,000  | 31,900  |
| St. Louis, MO     | 263,900                                                | 74,030                                 | 43,390                                                               | 146,480                                                       | 24,460                                          | 122,020                                          | 6,060                                                                       | 23,770  | 39,230  | 22,650  | 30,310  |
| Indianapolis, IN  | 256,650                                                | 53,730                                 | 1,850                                                                | 201,070                                                       | 49,800                                          | 151,270                                          | 8,870                                                                       | 22,770  | 33,160  | 20,260  | 66,210  |
| Raleigh, NC       | 255,150                                                | 92,230                                 | 3,800                                                                | 159,120                                                       | 61,010                                          | 98,110                                           | 3,450                                                                       | 13,480  | 22,310  | 16,080  | 42,790  |
| Cincinnati, OH    | 248,490                                                | 56,890                                 | 5,520                                                                | 186,080                                                       | 56,400                                          | 129,680                                          | 4,180                                                                       | 22,060  | 34,530  | 14,620  | 54,290  |
| Nashville, TN     | 248,260                                                | 98,970                                 | 4,850                                                                | 144,440                                                       | 30,400                                          | 114,040                                          | 6,530                                                                       | 19,230  | 32,130  | 14,040  | 42,110  |
| Daytona Beach, FL | 235,670                                                | 35,020                                 | 620                                                                  | 200,030                                                       | 133,640                                         | 66,390                                           | 460                                                                         | 8,520   | 9,740   | 24,280  | 23,390  |
| Montgomery, AL    | 227,500                                                | 33,990                                 | 1,740                                                                | 191,770                                                       | 129,170                                         | 62,600                                           | 260                                                                         | 9,460   | 16,710  | 15,520  | 20,650  |
| Augusta, GA       | 220,540                                                | 26,700                                 | 3,670                                                                | 190,170                                                       | 123,990                                         | 66,180                                           | 2,290                                                                       | 10,050  | 7,680   | 17,200  | 28,960  |
| Columbus, OH      | 219,830                                                | 48,000                                 | 660                                                                  | 171,170                                                       | 49,140                                          | 122,030                                          | 3,270                                                                       | 21,150  | 24,080  | 10,240  | 63,290  |
| Knoxville, TN     | 219,180                                                | 54,520                                 | 6,350                                                                | 158,310                                                       | 77,760                                          | 80,550                                           | 3,190                                                                       | 13,900  | 17,650  | 10,130  | 35,680  |
| Chattanooga, TN   | 206,690                                                | 17,380                                 | 6,840                                                                | 182,470                                                       | 108,640                                         | 73,830                                           | 1,570                                                                       | 9,070   | 14,310  | 16,150  | 32,730  |
| Mobile, AL        | 204,500                                                | 49,040                                 | 680                                                                  | 154,780                                                       | 95,430                                          | 59,350                                           | 720                                                                         | 11,710  | 16,010  | 14,350  | 16,560  |
| Greensboro, NC    | 201,050                                                | 70,480                                 | 2,570                                                                | 128,000                                                       | 49,760                                          | 78,240                                           | 3,190                                                                       | 10,700  | 15,810  | 10,200  | 38,340  |
| Pensacola, FL     | 199,930                                                | 35,550                                 | 790                                                                  | 163,590                                                       | 103,050                                         | 60,540                                           | 430                                                                         | 8,940   | 15,190  | 14,930  | 21,050  |
| Jackson, MS       | 192,050                                                | 61,200                                 | 2,730                                                                | 128,120                                                       | 62,790                                          | 65,330                                           | 1,770                                                                       | 13,240  | 16,040  | 17,480  | 16,800  |
| Dayton, OH        | 188,210                                                | 38,800                                 | 940                                                                  | 148,470                                                       | 46,680                                          | 101,790                                          | 5,380                                                                       | 19,670  | 23,740  | 10,120  | 42,880  |

<sup>2,3,4,5,6</sup> See explanatory notes on page II-22.

TABLE 5-1 (continued)

| City                | Total<br>Pass.<br>to &<br>from<br>Atlanta | O-D<br>Pass.                                   | Pass.<br>Orig.<br>or<br>Term.<br>at<br>Atlanta<br>only. | Pass.<br>Connect.<br>to<br>Other<br>Flights<br>at<br>Atlanta. | CONNECTING TRAFFIC AT ATLANTA                   |                                                  |                                                                             |         |         |         |         |
|---------------------|-------------------------------------------|------------------------------------------------|---------------------------------------------------------|---------------------------------------------------------------|-------------------------------------------------|--------------------------------------------------|-----------------------------------------------------------------------------|---------|---------|---------|---------|
|                     |                                           |                                                |                                                         |                                                               | Pass.<br>Connect.<br>to long<br>haul<br>flights | Pass.<br>Connect.<br>to short<br>haul<br>flights | Short Haul Connecting Traffic at Atlanta<br>Subdivided into Mileage Blocks. |         |         |         |         |
|                     |                                           |                                                |                                                         |                                                               |                                                 |                                                  | 0-100                                                                       | 100-200 | 200-300 | 300-400 | 400-500 |
| Sarasota, FL        | 185,310                                   | 27,720                                         | 410                                                     | 157,180                                                       | 95,250                                          | 61,930                                           | 910                                                                         | 9,660   | 7,010   | 18,350  | 26,000  |
| Columbus, GA        | 181,550                                   | 18,750                                         | 660                                                     | 162,140                                                       | 98,470                                          | 63,670                                           | 0                                                                           | 10,280  | 14,000  | 18,410  | 20,980  |
| Tallahassee, FL     | 174,010                                   | 38,250                                         | 1,770                                                   | 133,990                                                       | 87,740                                          | 46,250                                           | 420                                                                         | 7,760   | 7,220   | 17,570  | 13,280  |
| Richmond, VA        | 172,670                                   | 57,570                                         | 1,280                                                   | 113,820                                                       | 38,930                                          | 74,890                                           | 4,580                                                                       | 14,490  | 13,940  | 8,920   | 32,960  |
| Greenville, SC      | 163,960                                   | 26,730                                         | 2,190                                                   | 135,040                                                       | 61,450                                          | 73,590                                           | 1,850                                                                       | 9,820   | 16,680  | 14,830  | 30,410  |
| Melborne, FL        | 159,550                                   | 18,070                                         | 140                                                     | 141,340                                                       | 99,100                                          | 42,240                                           | 920                                                                         | 6,720   | 5,830   | 14,300  | 14,470  |
| Huntsville, AL      | 142,720                                   | 32,950                                         | 2,170                                                   | 107,600                                                       | 61,190                                          | 46,410                                           | 1,200                                                                       | 6,500   | 12,370  | 9,400   | 16,940  |
| Macon, GA           | 130,200                                   | 7,230                                          | 40                                                      | 122,930                                                       | 84,640                                          | 38,290                                           | 0                                                                           | 5,110   | 6,460   | 10,730  | 15,990  |
| Lexington, KY       | 115,540                                   | 28,170                                         | 420                                                     | 86,950                                                        | 37,850                                          | 49,100                                           | 1,790                                                                       | 7,860   | 10,610  | 6,200   | 22,640  |
| Asheville, NC       | 115,030                                   | 21,240                                         | 2,070                                                   | 91,720                                                        | 49,440                                          | 42,280                                           | 480                                                                         | 3,560   | 7,970   | 5,750   | 24,520  |
| Gainesville, FL     | 108,940                                   | 17,970                                         | 250                                                     | 90,720                                                        | 61,710                                          | 29,010                                           | 50                                                                          | 4,850   | 4,860   | 11,120  | 8,130   |
| Fayetteville, NC    | 103,800                                   | 24,550                                         | 2,420                                                   | 76,830                                                        | 41,300                                          | 35,530                                           | 3,280                                                                       | 5,870   | 4,910   | 5,650   | 15,820  |
| Bristol, TN         | 88,120                                    | 29,180                                         | 2,000                                                   | 56,940                                                        | 26,290                                          | 30,650                                           | 960                                                                         | 4,250   | 6,310   | 3,840   | 15,290  |
| Roanoke, VA         | 87,150                                    | 26,500                                         | 5,230                                                   | 55,420                                                        | 21,530                                          | 33,890                                           | 1,270                                                                       | 5,560   | 6,820   | 4,660   | 15,580  |
| Charleston, WV      | 85,760                                    | 16,900                                         | 1,280                                                   | 67,580                                                        | 28,620                                          | 38,960                                           | 510                                                                         | 3,860   | 7,580   | 5,110   | 21,900  |
| Eglin A.F. Base, FL | 80,520                                    | 15,860                                         | 770                                                     | 63,890                                                        | 40,100                                          | 23,790                                           | 600                                                                         | 5,250   | 3,730   | 5,540   | 8,670   |
| Albany, GA          | 76,270                                    | 20,800                                         | 100                                                     | 55,370                                                        | 35,220                                          | 20,150                                           | 50                                                                          | 3,040   | 3,330   | 7,690   | 6,040   |
| Dothan, AL          | 73,370                                    | 16,130                                         | 100                                                     | 57,140                                                        | 36,530                                          | 20,610                                           | 140                                                                         | 4,770   | 4,070   | 5,910   | 5,720   |
| Panama City, FL     | 70,740                                    | 18,310                                         | 0                                                       | 52,430                                                        | 33,170                                          | 19,260                                           | 60                                                                          | 4,620   | 3,500   | 5,730   | 5,350   |
| Brunswick, GA       | 11,220                                    | 0                                              | 0                                                       | 11,220                                                        | 7,150                                           | 4,070                                            | 50                                                                          | 400     | 330     | 2,060   | 1,230   |
|                     | 57,825                                    | Commuter carrier data. See Explanatory note 1. |                                                         |                                                               |                                                 |                                                  |                                                                             |         |         |         |         |
| Baton Rouge, LA     | 68,470                                    | 18,060                                         | 70                                                      | 50,340                                                        | 26,440                                          | 23,900                                           | 600                                                                         | 5,620   | 4,870   | 5,990   | 6,820   |
| Gulfport, MS        | 48,490                                    | 11,390                                         | 90                                                      | 37,010                                                        | 20,050                                          | 16,960                                           | 430                                                                         | 3,180   | 4,130   | 5,170   | 4,050   |
| Little Rock, AR     | 44,550                                    | 21,700                                         | 600                                                     | 22,250                                                        | 6,680                                           | 15,570                                           | 560                                                                         | 3,940   | 4,490   | 2,260   | 4,320   |
| Wilmington, NC      | 42,060                                    | 15,620                                         | 750                                                     | 25,690                                                        | 11,860                                          | 13,830                                           | 250                                                                         | 1,940   | 3,150   | 2,420   | 6,070   |
| Evansville, IN      | 40,380                                    | 10,490                                         | 160                                                     | 29,730                                                        | 11,190                                          | 18,540                                           | 300                                                                         | 1,700   | 4,210   | 2,720   | 9,610   |
| Monroe, LA          | 37,660                                    | 7,820                                          | 180                                                     | 29,660                                                        | 17,140                                          | 12,520                                           | 370                                                                         | 2,820   | 3,440   | 2,550   | 3,340   |

TABLE 5-1 (continued)

|                     |                                           |                                                |                                                      |                                                            | CONNECTING TRAFFIC AT ATLANTA                   |                                                  |                                                                             |         |         |         |         |
|---------------------|-------------------------------------------|------------------------------------------------|------------------------------------------------------|------------------------------------------------------------|-------------------------------------------------|--------------------------------------------------|-----------------------------------------------------------------------------|---------|---------|---------|---------|
| City                | Total<br>Pass.<br>to &<br>from<br>Atlanta | O-D<br>Pass.                                   | Pass.<br>Orig.<br>or<br>Term. at<br>Atlanta<br>only. | Pass.<br>Connect.<br>to<br>Other<br>Flights at<br>Atlanta. | Pass.<br>Connect.<br>to long<br>haul<br>flights | Pass.<br>Connect.<br>to short<br>haul<br>flights | Short Haul Connecting Traffic at Atlanta<br>Subdivided into Mileage Blocks. |         |         |         |         |
|                     |                                           |                                                |                                                      |                                                            |                                                 |                                                  | 0-100                                                                       | 100-200 | 200-300 | 300-400 | 400-500 |
| Tuscaloosa, AL      | 34,800                                    | 9,710                                          | 0                                                    | 25,090                                                     | 15,510                                          | 9,580                                            | 110                                                                         | 2,620   | 2,500   | 1,960   | 2,390   |
| Meridian, MS        | 34,380                                    | 7,420                                          | 90                                                   | 26,870                                                     | 16,880                                          | 9,990                                            | 0                                                                           | 1,840   | 2,920   | 2,120   | 3,110   |
| Jacksonville, NC    | 32,810                                    | 4,940                                          | 0                                                    | 27,870                                                     | 13,990                                          | 13,880                                           | 550                                                                         | 2,060   | 2,020   | 3,880   | 5,370   |
| Alexandria, LA      | 31,040                                    | 6,500                                          | 0                                                    | 24,540                                                     | 13,270                                          | 11,270                                           | 430                                                                         | 2,360   | 2,350   | 2,640   | 3,490   |
| Florence, SC        | 28,980                                    | 9,590                                          | 60                                                   | 19,330                                                     | 10,880                                          | 8,450                                            | 320                                                                         | 1,180   | 980     | 1,760   | 4,210   |
| Myrtle Beach, SC    | 26,890                                    | 9,290                                          | 60                                                   | 17,540                                                     | 9,710                                           | 7,830                                            | 0                                                                           | 1,290   | 850     | 2,370   | 3,320   |
| Valdosta, GA        | 25,280                                    | 6,890                                          | 0                                                    | 18,390                                                     | 11,260                                          | 7,130                                            | 260                                                                         | 1,510   | 1,110   | 2,560   | 1,690   |
| Columbus, MS        | 23,410                                    | 7,270                                          | 100                                                  | 16,040                                                     | 9,440                                           | 6,600                                            | 210                                                                         | 1,110   | 1,520   | 1,940   | 1,820   |
| Hilton Head, SC     | 7,540                                     | 0                                              | 0                                                    | 7,540                                                      | 5,790                                           | 1,750                                            | 0                                                                           | 210     | 0       | 720     | 820     |
|                     | 15,070                                    | Commuter carrier data. See Explanatory note 1. |                                                      |                                                            |                                                 |                                                  |                                                                             |         |         |         |         |
| Kinston, NC         | 20,970                                    | 8,730                                          | 0                                                    | 12,240                                                     | 4,600                                           | 7,640                                            | 280                                                                         | 1,480   | 1,480   | 1,280   | 3,120   |
| Winston-Salem, NC   | 20,460                                    | 12,310                                         | 100                                                  | 8,050                                                      | 3,580                                           | 4,470                                            | 210                                                                         | 800     | 750     | 620     | 2,090   |
| Hickory, NC         | 17,300                                    | 5,740                                          | 0                                                    | 11,560                                                     | 6,300                                           | 5,260                                            | 0                                                                           | 380     | 950     | 1,350   | 2,580   |
| New Bern, NC        | 16,610                                    | 3,860                                          | 0                                                    | 12,750                                                     | 5,760                                           | 6,990                                            | 200                                                                         | 820     | 1,350   | 1,390   | 3,230   |
| Lynchburg, VA       | 14,410                                    | 5,850                                          | 110                                                  | 8,450                                                      | 3,180                                           | 5,270                                            | 0                                                                           | 1,540   | 790     | 620     | 2,320   |
| Ashland, KY         | 9,520                                     | 4,070                                          | 290                                                  | 5,160                                                      | 1,730                                           | 3,430                                            | 50                                                                          | 100     | 740     | 240     | 2,300   |
| Charlottesville, VA | 9,200                                     | 5,090                                          | 120                                                  | 3,990                                                      | 1,270                                           | 2,720                                            | 0                                                                           | 470     | 630     | 280     | 1,340   |
| Waycross, GA        | 1,150                                     | 0                                              | 0                                                    | 1,150                                                      | 710                                             | 440                                              | 0                                                                           | 0       | 220     | 220     | 0       |
|                     | 7,571                                     | Commuter carrier data. See Explanatory note 1. |                                                      |                                                            |                                                 |                                                  |                                                                             |         |         |         |         |
| Beaufort, SC        | 700                                       | 0                                              | 0                                                    | 700                                                        | 700                                             | 0                                                | 0                                                                           | 0       | 0       | 0       | 0       |
|                     | 4,056                                     | Commuter carrier data. See Explanatory note 1. |                                                      |                                                            |                                                 |                                                  |                                                                             |         |         |         |         |
| Muscle Shoals, AL   | 3,940                                     | 1,750                                          | 0                                                    | 2,190                                                      | 1,500                                           | 690                                              | 0                                                                           | 150     | 40      | 180     | 320     |
| Tifton, GA          | 3,766                                     |                                                |                                                      |                                                            |                                                 |                                                  |                                                                             |         |         |         |         |
| Dublin, GA          | 3,209                                     | Commuter carrier data. See Explanatory note 1. |                                                      |                                                            |                                                 |                                                  |                                                                             |         |         |         |         |
| Thomasville, GA     | 3080                                      | Certificated carrier data.                     |                                                      |                                                            |                                                 |                                                  |                                                                             |         |         |         |         |
|                     | 2008                                      | Commuter carrier data.                         |                                                      |                                                            |                                                 |                                                  |                                                                             |         |         |         |         |

## EXPLANATORY NOTES FOR TABLE 5-1

1. Data source is the CAB Origin - Destination Survey of Airline Passenger Traffic for certificated carriers, and CAB commuter carrier activity data. Data for certificated carriers was accessed through I.P. Sharp Associates. No breakdown of passenger counts is available for commuter carrier data.
2. Total number of passengers to and from Atlanta does not include through passengers at Atlanta or at the specified city.
3. Origin-Destination (O-D) passengers are those whose journey originates or terminates at Atlanta, and the specified city.
4. Passengers originating or terminating at Atlanta does not include O-D passengers. These passengers are making a connection at the specified city only.
5. Connecting traffic at Atlanta may or may not also make a connection at the specified city.
6. Short haul is considered to be city pairs which are less than 500 miles apart, long haul those which are more than 500 miles apart.

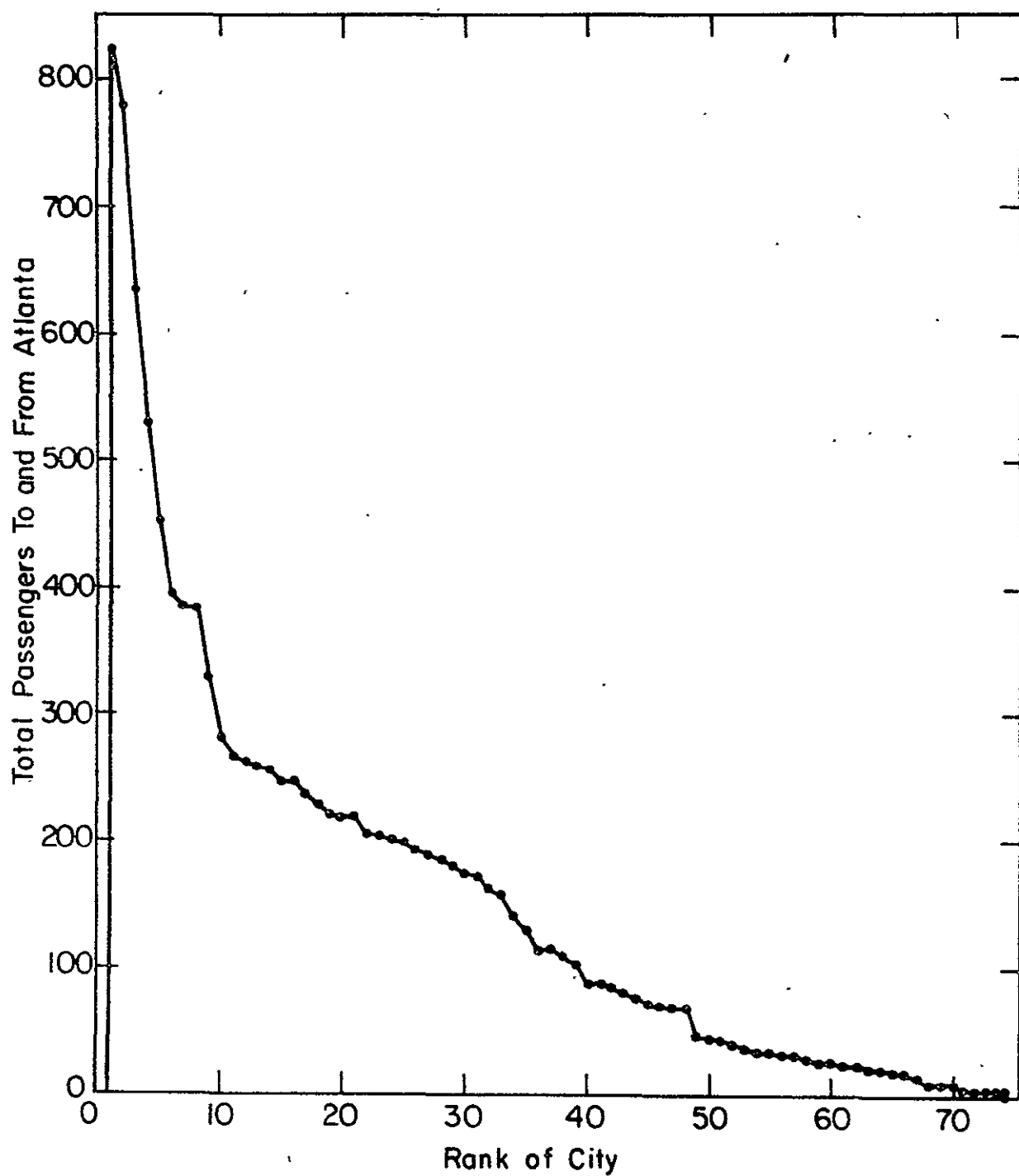


FIG.5-2 DISTRIBUTION OF TOTAL PASSENGERS TO AND FROM ATLANTA FOR ALL CITIES IN THIS STUDY

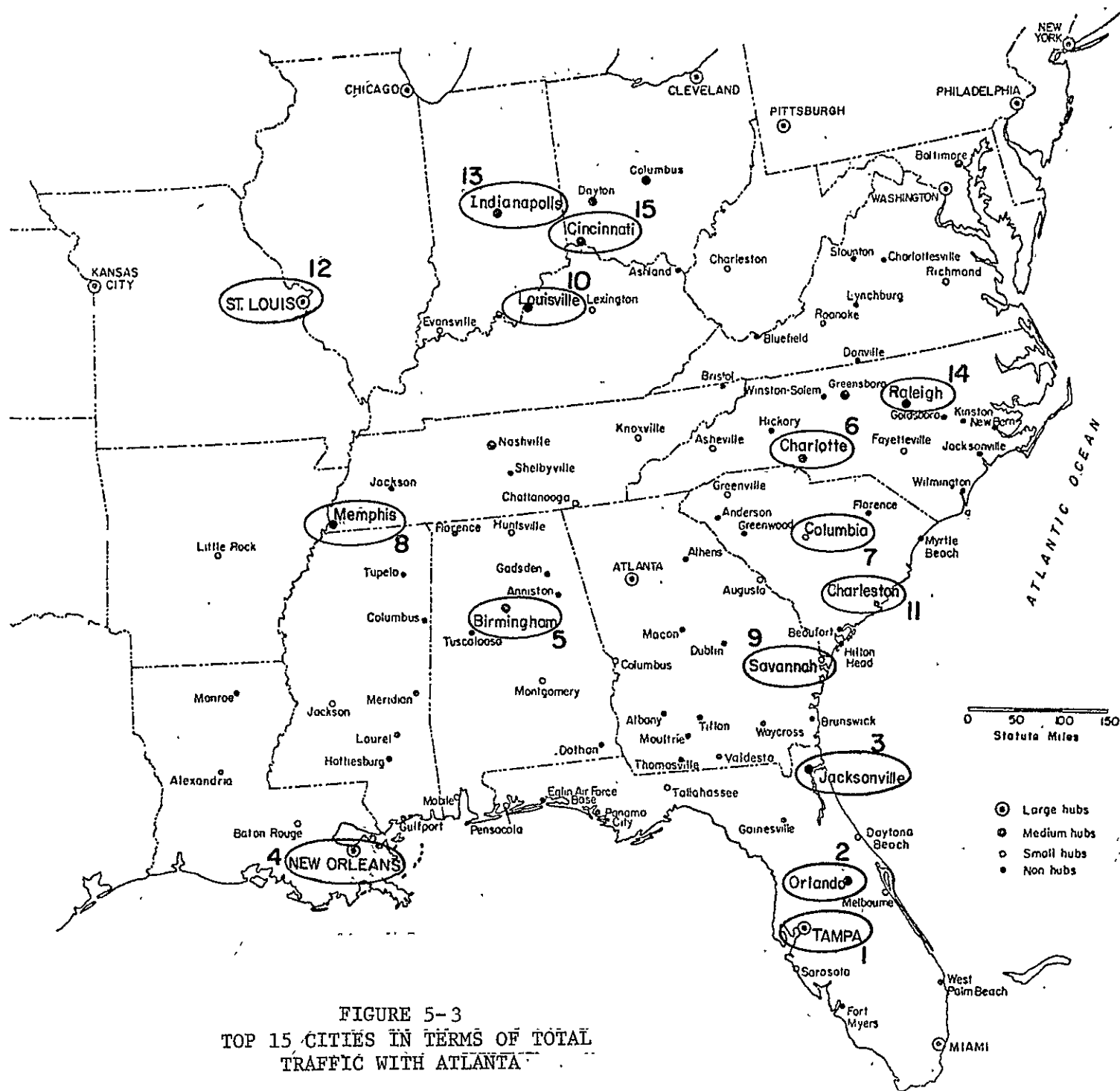


FIGURE 5-3  
TOP 15 CITIES IN TERMS OF TOTAL  
TRAFFIC WITH ATLANTA

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TABLE 5-2

O-D and Connecting Traffic Related to Total Traffic  
At Atlanta for the Top Fifteen Short Haul Cities

| City             | Total # of<br>Passengers<br>to and from<br>Atlanta | O-D Traffic        |               | # of<br>Passengers<br>Originating<br>or<br>Terminating<br>at Atlanta | Connecting Traffic<br>at Atlanta |               |
|------------------|----------------------------------------------------|--------------------|---------------|----------------------------------------------------------------------|----------------------------------|---------------|
|                  |                                                    | # of<br>Passengers | % of<br>Total |                                                                      | # of<br>Passengers               | % of<br>Total |
| Tampa, FL        | 824,570                                            | 190,600            | 23.1          | 13,090                                                               | 620,880                          | 75.3          |
| Orlando, FL      | 781,870                                            | 136,950            | 17.5          | 7,090                                                                | 637,830                          | 81.5          |
| Jacksonville, FL | 633,890                                            | 147,540            | 23.3          | 8,000                                                                | 478,350                          | 75.5          |
| New Orleans, LA  | 528,460                                            | 118,500            | 22.4          | 16,410                                                               | 393,550                          | 74.5          |
| Birmingham, AL   | 452,760                                            | 103,180            | 22.8          | 8,840                                                                | 340,740                          | 75.3          |
| Charlotte, NC    | 393,730                                            | 127,630            | 32.4          | 15,750                                                               | 250,350                          | 63.6          |
| Columbia, SC     | 385,320                                            | 72,290             | 18.7          | 7,640                                                                | 305,890                          | 79.3          |
| Memphis, TN      | 383,580                                            | 129,940            | 33.9          | 56,980                                                               | 196,660                          | 51.3          |
| Savannah, GA     | 327,790                                            | 92,430             | 28.2          | 3,850                                                                | 231,510                          | 70.6          |
| Louisville, KY   | 281,040                                            | 74,440             | 26.5          | 7,180                                                                | 199,420                          | 71.0          |
| Charleston, SC   | 266,480                                            | 50,690             | 19.0          | 2,700                                                                | 213,090                          | 80.0          |
| St. Louis, MO    | 263,900                                            | 74,030             | 28.1          | 43,390                                                               | 146,480                          | 55.5          |
| Indianapolis, IN | 256,650                                            | 53,730             | 20.9          | 1,850                                                                | 201,070                          | 78.3          |
| Raleigh, NC      | 255,150                                            | 92,280             | 36.1          | 3,800                                                                | 159,120                          | 62.4          |
| Cincinnati, OH   | 248,490                                            | 56,890             | 22.9          | 5,520                                                                | 186,080                          | 74.9          |

Notes

1. Data is from the Civil Aeronautics Board Origin-Destination Survey for 1974.
2. Passenger figures are totals for the year 1974.
3. Percentages are in terms of the total # of passengers for the specific city to and from Atlanta.



TABLE 5-3

Long Haul and Short Haul Subdivision of Connecting  
Traffic at Atlanta for the Top Fifteen Short Haul Cities

| City             | Total # of<br>Passengers<br>to and<br>from<br>Atlanta | # of<br>Passengers<br>Making<br>Connections<br>at Atlanta | Passengers Connecting<br>With Long Haul Flight<br>Segments at Atlanta |                               | Passengers Connecting<br>With Short Haul Flight<br>Segments at Atlanta |                               |
|------------------|-------------------------------------------------------|-----------------------------------------------------------|-----------------------------------------------------------------------|-------------------------------|------------------------------------------------------------------------|-------------------------------|
|                  |                                                       |                                                           | # of<br>Passengers                                                    | % of<br>Total For<br>The City | # of<br>Passengers                                                     | % of<br>Total For<br>The City |
| Tampa, FL        | 824,570                                               | 620,880                                                   | 262,860                                                               | 31.9                          | 358,020                                                                | 43.4                          |
| Orlando, FL      | 781,870                                               | 637,830                                                   | 366,970                                                               | 46.9                          | 270,860                                                                | 34.6                          |
| Jacksonville, FL | 633,890                                               | 478,350                                                   | 276,170                                                               | 43.6                          | 202,180                                                                | 31.9                          |
| New Orleans, LA  | 528,460                                               | 393,550                                                   | 182,190                                                               | 34.5                          | 211,360                                                                | 40.0                          |
| Birmingham, AL   | 452,760                                               | 340,740                                                   | 211,790                                                               | 46.8                          | 128,950                                                                | 28.5                          |
| Charlotte, NC    | 393,730                                               | 250,350                                                   | 112,240                                                               | 28.5                          | 138,010                                                                | 35.1                          |
| Columbia, SC     | 385,820                                               | 305,890                                                   | 174,040                                                               | 45.1                          | 131,850                                                                | 34.2                          |
| Memphis, TN      | 383,580                                               | 196,660                                                   | 61,440                                                                | 16.0                          | 135,220                                                                | 35.3                          |
| Savannah, GA     | 327,790                                               | 231,510                                                   | 159,500                                                               | 48.6                          | 72,010                                                                 | 22.0                          |
| Louisville, KY   | 281,040                                               | 199,420                                                   | 62,150                                                                | 22.2                          | 137,270                                                                | 48.8                          |
| Charleston, SC   | 266,480                                               | 213,090                                                   | 119,880                                                               | 45.0                          | 93,210                                                                 | 35.0                          |
| St. Louis, MO    | 263,900                                               | 146,480                                                   | 24,460                                                                | 9.3                           | 122,020                                                                | 46.2                          |
| Indianapolis, IN | 256,650                                               | 201,070                                                   | 49,800                                                                | 19.4                          | 151,270                                                                | 58.9                          |
| Raleigh, NC      | 255,150                                               | 159,120                                                   | 61,010                                                                | 23.9                          | 98,110                                                                 | 38.5                          |
| Cincinnati, OH   | 248,490                                               | 186,080                                                   | 56,400                                                                | 22.7                          | 129,680                                                                | 52.2                          |

Notes

1. Data is from the Civil Aeronautics Board Origin-Destination Survey for '1974.
2. All passenger figures are for two way traffic.

TABLE 5-4  
Short Haul Connecting Traffic at  
Atlanta Subdivided by Length of Connecting Flight Segment  
for Top Fifteen Short Haul Cities

| City             | # of<br>Passengers<br>Connecting<br>With<br>Short Haul<br>Flight Segments | Passengers Connecting at Atlanta With Flight<br>Segments of Lengths: |         |         |         |         |
|------------------|---------------------------------------------------------------------------|----------------------------------------------------------------------|---------|---------|---------|---------|
|                  |                                                                           | 0~100                                                                | 100~200 | 200~300 | 300~400 | 400~500 |
| Tampa, FL        | 358,020                                                                   | 8,290                                                                | 83,140  | 61,180  | 110,460 | 94,950  |
| Orlando, FL      | 270,860                                                                   | 4,650                                                                | 48,140  | 33,010  | 89,260  | 95,800  |
| Jacksonville, FL | 202,180                                                                   | 4,400                                                                | 39,630  | 35,640  | 73,040  | 49,470  |
| New Orleans, LA  | 211,360                                                                   | 4,600                                                                | 37,230  | 45,370  | 62,550  | 61,610  |
| Birmingham, AL   | 128,950                                                                   | 1,970                                                                | 21,370  | 29,430  | 33,390  | 42,790  |
| Charlotte, NC    | 138,010                                                                   | 5,740                                                                | 17,170  | 26,670  | 28,190  | 60,240  |
| Columbia, SC     | 131,850                                                                   | 10,490                                                               | 19,800  | 15,980  | 33,590  | 51,990  |
| Memphis, TN      | 135,220                                                                   | 6,980                                                                | 31,860  | 42,490  | 19,620  | 34,270  |
| Savannah, GA     | 72,010                                                                    | 2,270                                                                | 12,950  | 6,510   | 22,510  | 27,770  |
| Louisville, KY   | 137,270                                                                   | 5,000                                                                | 27,130  | 39,200  | 18,800  | 47,140  |
| Charleston, SC   | 93,210                                                                    | 3,900                                                                | 17,650  | 9,760   | 30,000  | 31,900  |
| St. Louis, MO    | 122,020                                                                   | 6,060                                                                | 23,770  | 39,230  | 22,650  | 30,310  |
| Indianapolis, IN | 151,270                                                                   | 8,870                                                                | 22,770  | 33,160  | 20,260  | 66,210  |
| Raleigh, NC      | 98,110                                                                    | 3,450                                                                | 13,480  | 22,310  | 16,080  | 42,790  |
| Cincinnati, OH   | 129,680                                                                   | 4,180                                                                | 22,060  | 34,530  | 14,620  | 54,290  |

Notes

1. Data is from the Civil Aeronautics Board Origin-Destination Survey for 1974.
2. All passenger figures are for two way traffic.

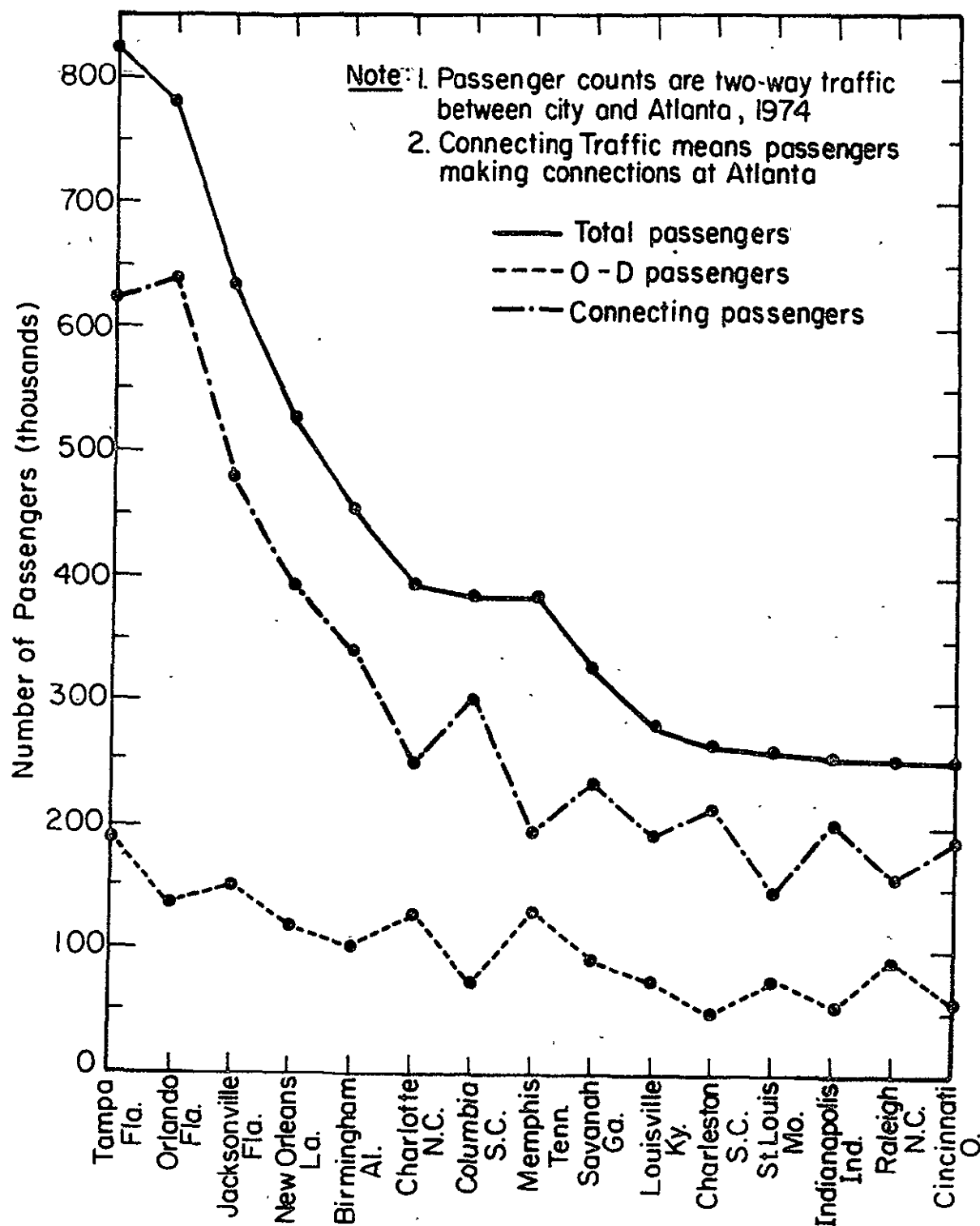


FIG.5-4 O-D AND CONNECTING TRAFFIC COMPARED WITH TOTAL TRAFFIC FOR THE TOP 15 CITIES IN THE STUDY.

State. On the other hand, 55% connecting traffic from St. Louis is understandably lower since St. Louis is closer to Chicago which acts as a major hub for connections in that region.

The comparison of short haul and long haul connections shows approximately equivalent orders of magnitude. Figure 5-5 shows these numbers for the 15 cities under consideration.

Another way to look at the breakdown of traffic movements among O-D, long haul, and short haul connections is by way of the histograms shown in Figure 5-6. These histograms shown that the predominant numbers (the modes) are as follows:

- Origin-Destination Traffic: 20-30%.
- Short Haul Connecting Traffic: 30-40%
- Long Haul Connecting Traffic: 40-50%.

In order to look at the geographic distributions of cities with higher and lower percentages of connecting traffic than the above numbers, Figures 5-7 through 5-12 are presented. It is interesting to note on these figures the strong tendencies for geographic differences in the traffic patterns. For instance, Figure 5-7 shows that cities with high O-D percentages are all to the North of Atlanta. Conversely, most of the Florida cities have lower O-D and higher connecting traffic proportions. These tendencies should provide very useful insights into the effects of economic interaction between cities, and of the location of competing opportunities for such interaction on the demands for air transportation, and on the traffic flows resulting from the provision of any particular service pattern. The patterns exhibited in Figures 5-7 through 5-12 should be the subject of further analysis.

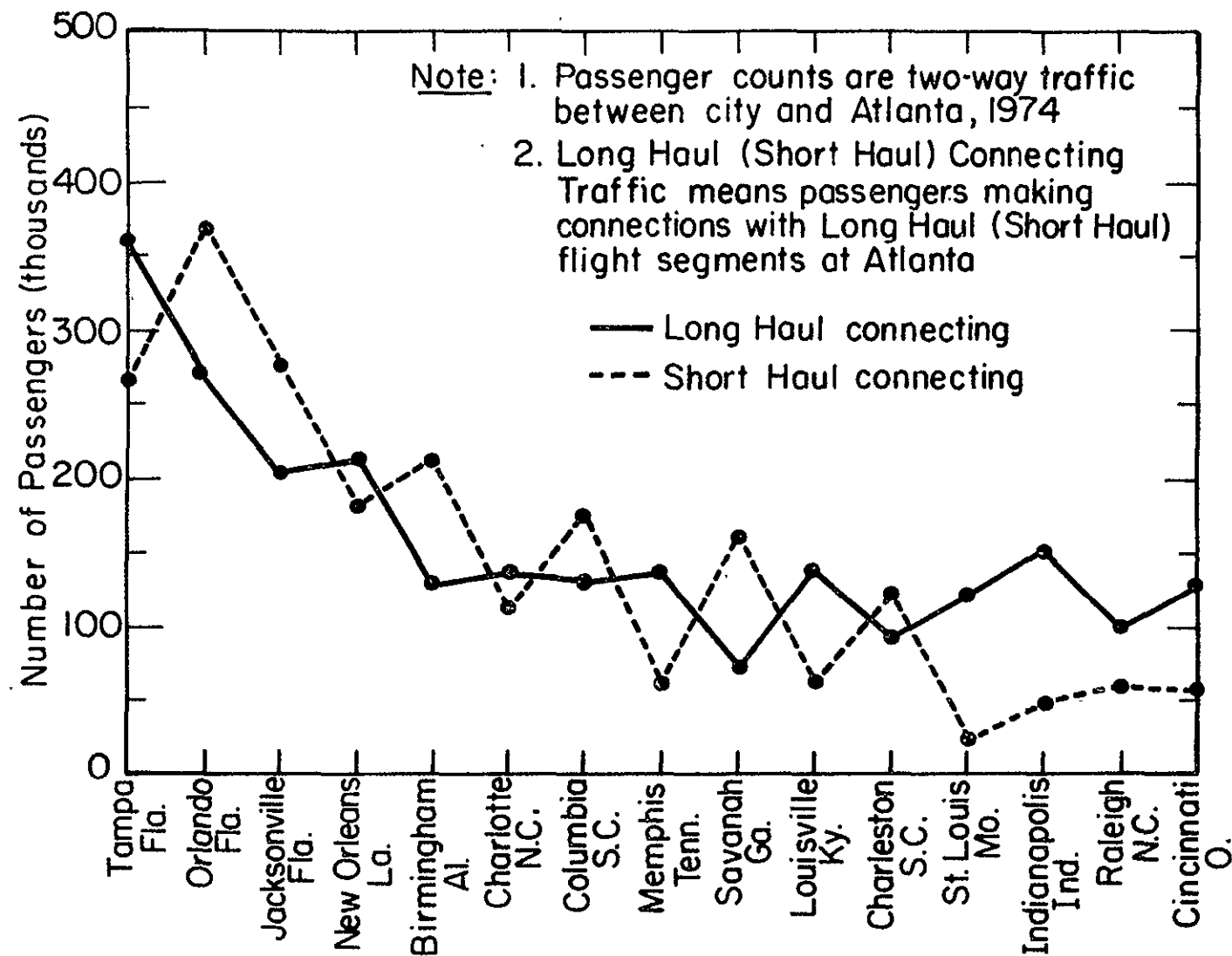


FIG. 5-5 LONG HAUL AND SHORT HAUL CONNECTING TRAFFIC COMPARED FOR THE TOP 15 CITIES IN THE STUDY

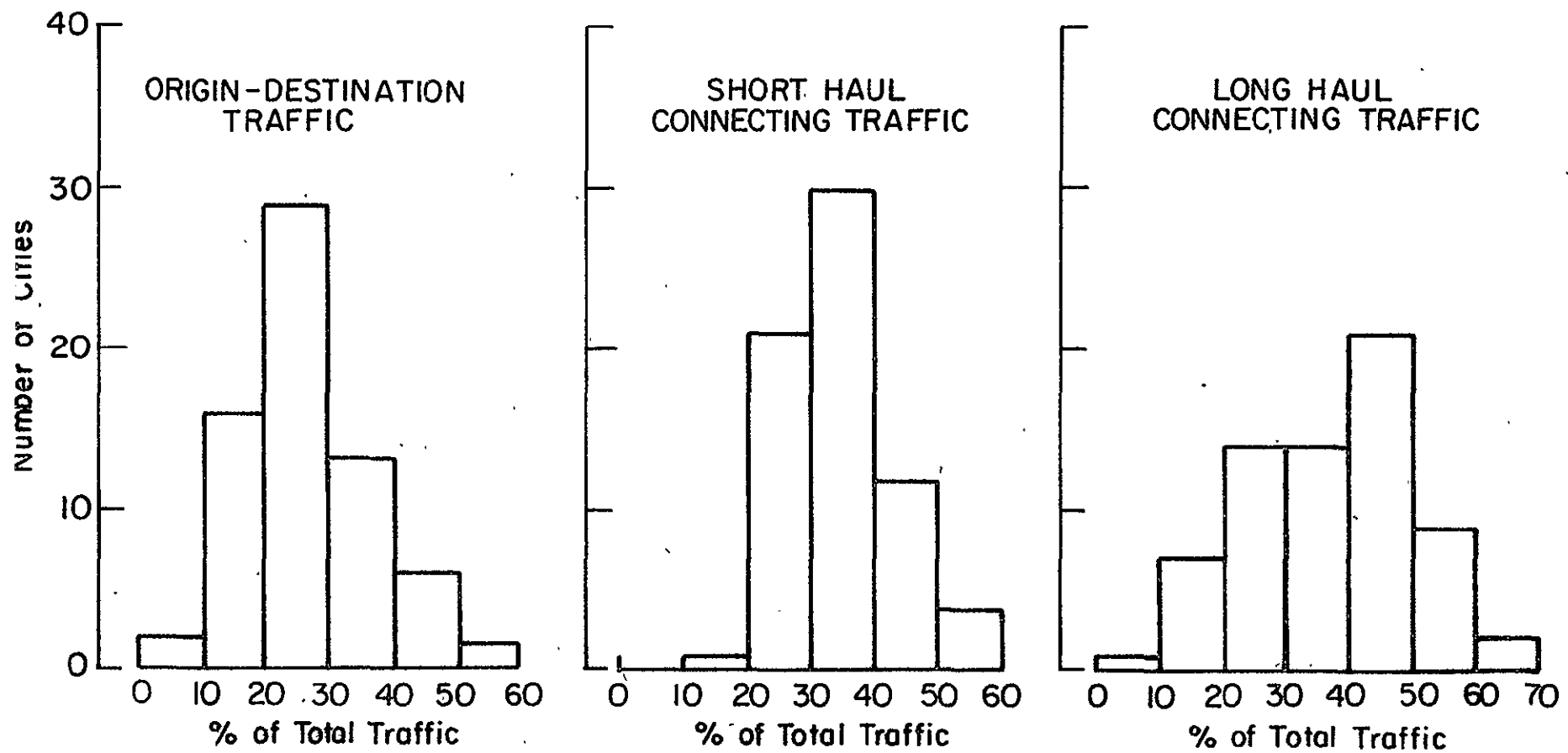


FIG. 5-6 DISTRIBUTION OF CITIES ACCORDING TO THEIR PERCENTAGES OF TRAFFIC IN EACH OF THREE GROUPS.

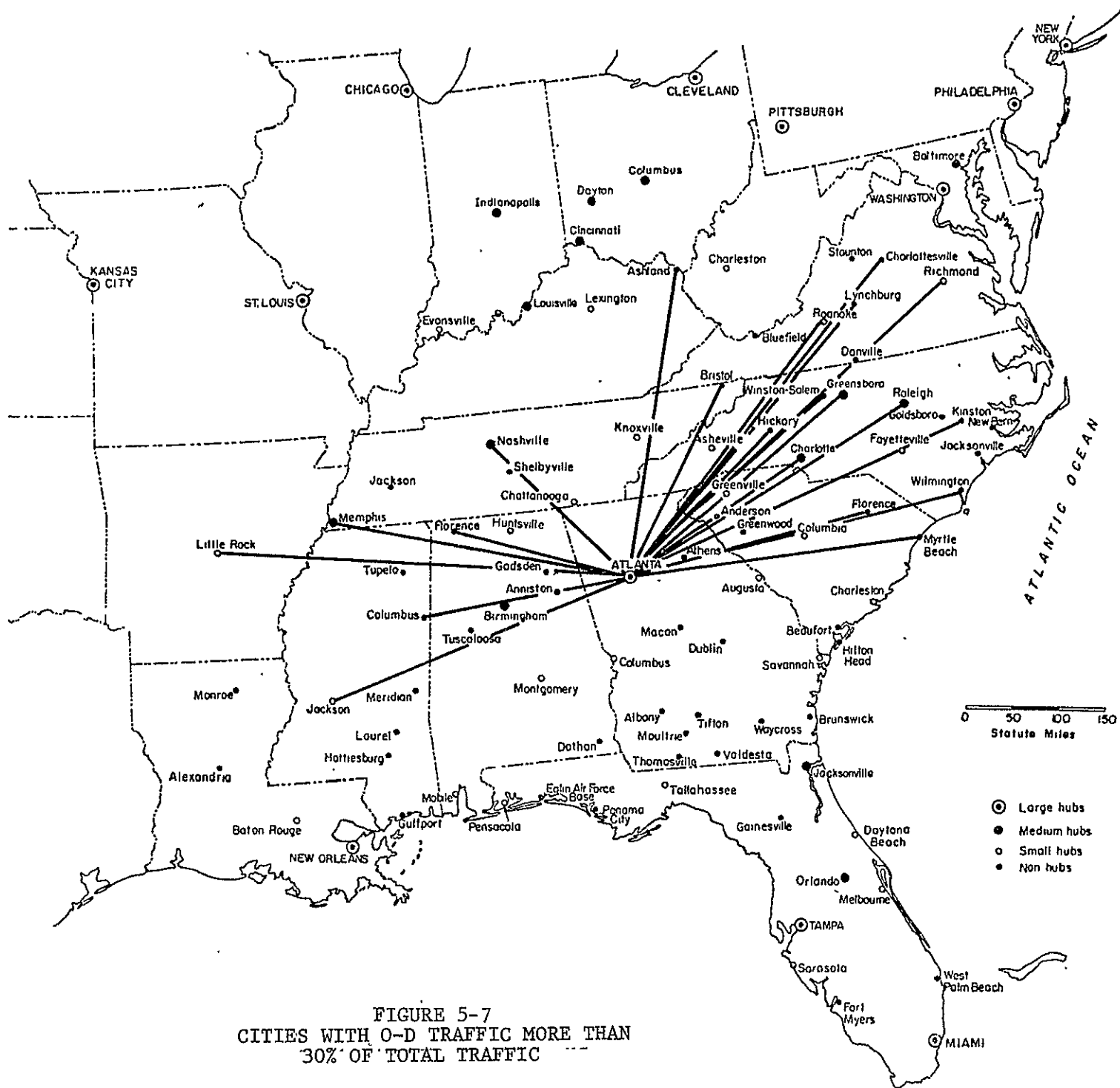


FIGURE 5-7  
CITIES WITH O-D TRAFFIC MORE THAN  
30% OF TOTAL TRAFFIC

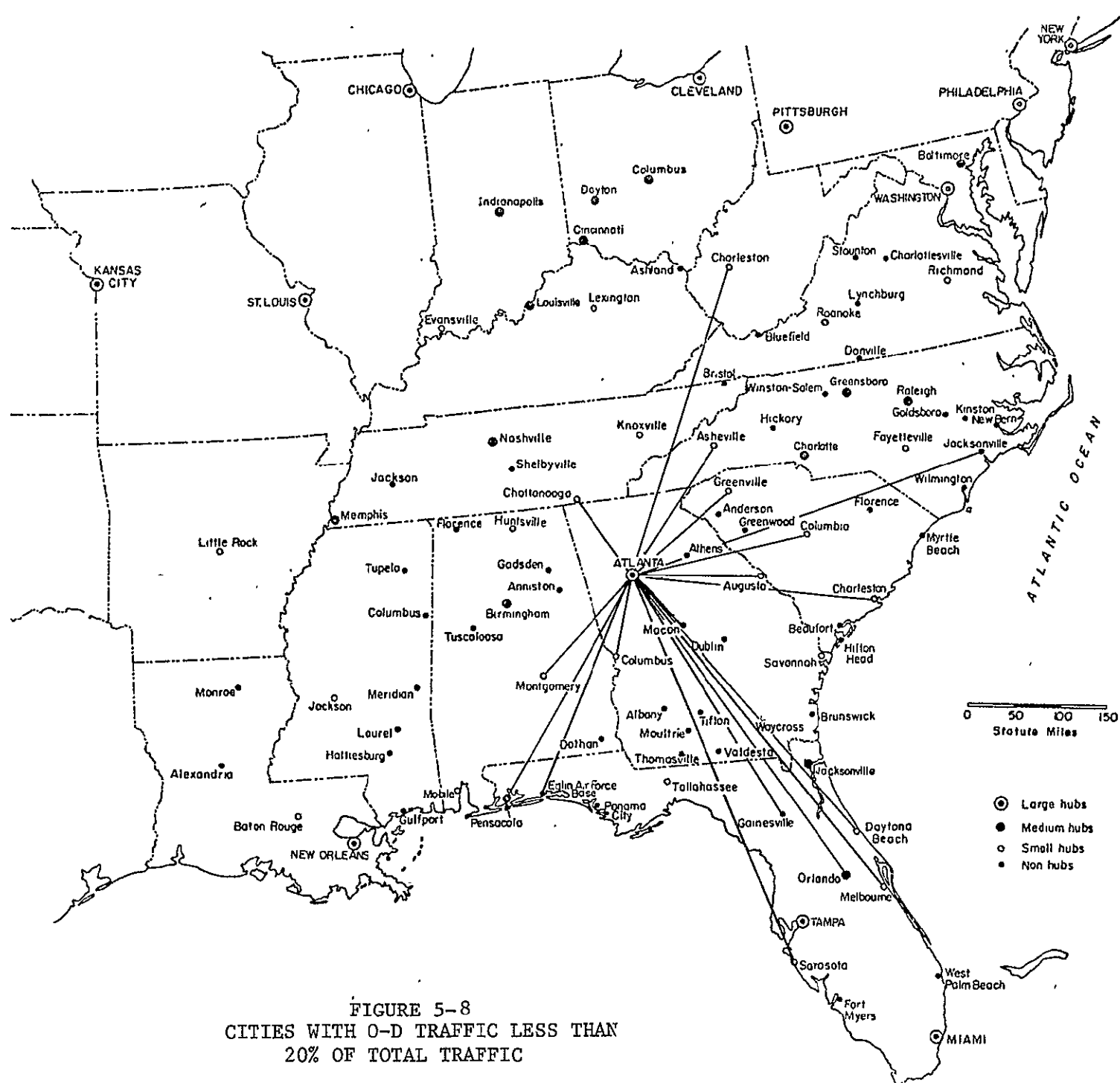


FIGURE 5-8  
CITIES WITH O-D TRAFFIC LESS THAN  
20% OF TOTAL TRAFFIC



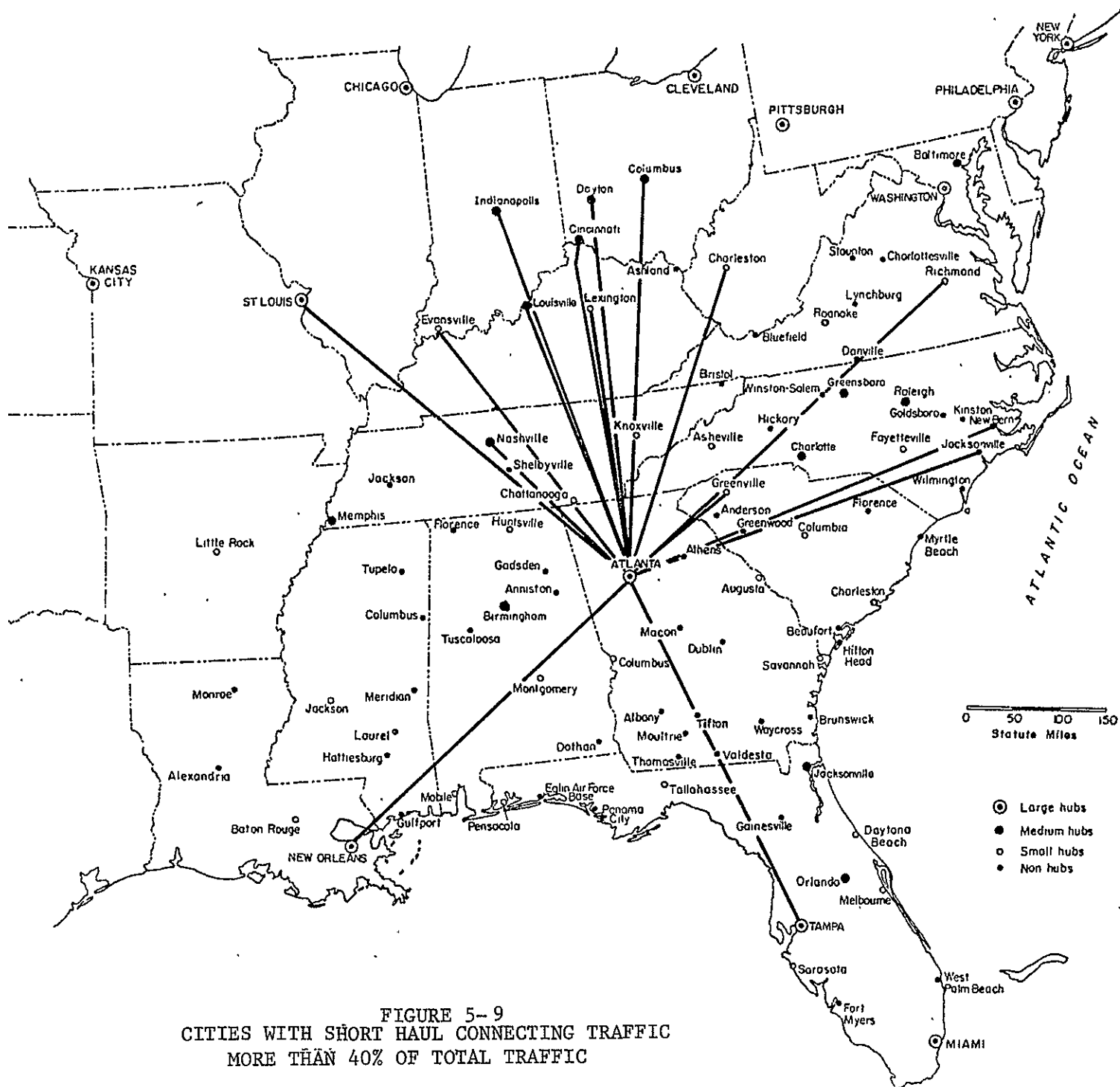


FIGURE 5-9  
CITIES WITH SHORT HAUL CONNECTING TRAFFIC  
MORE THAN 40% OF TOTAL TRAFFIC

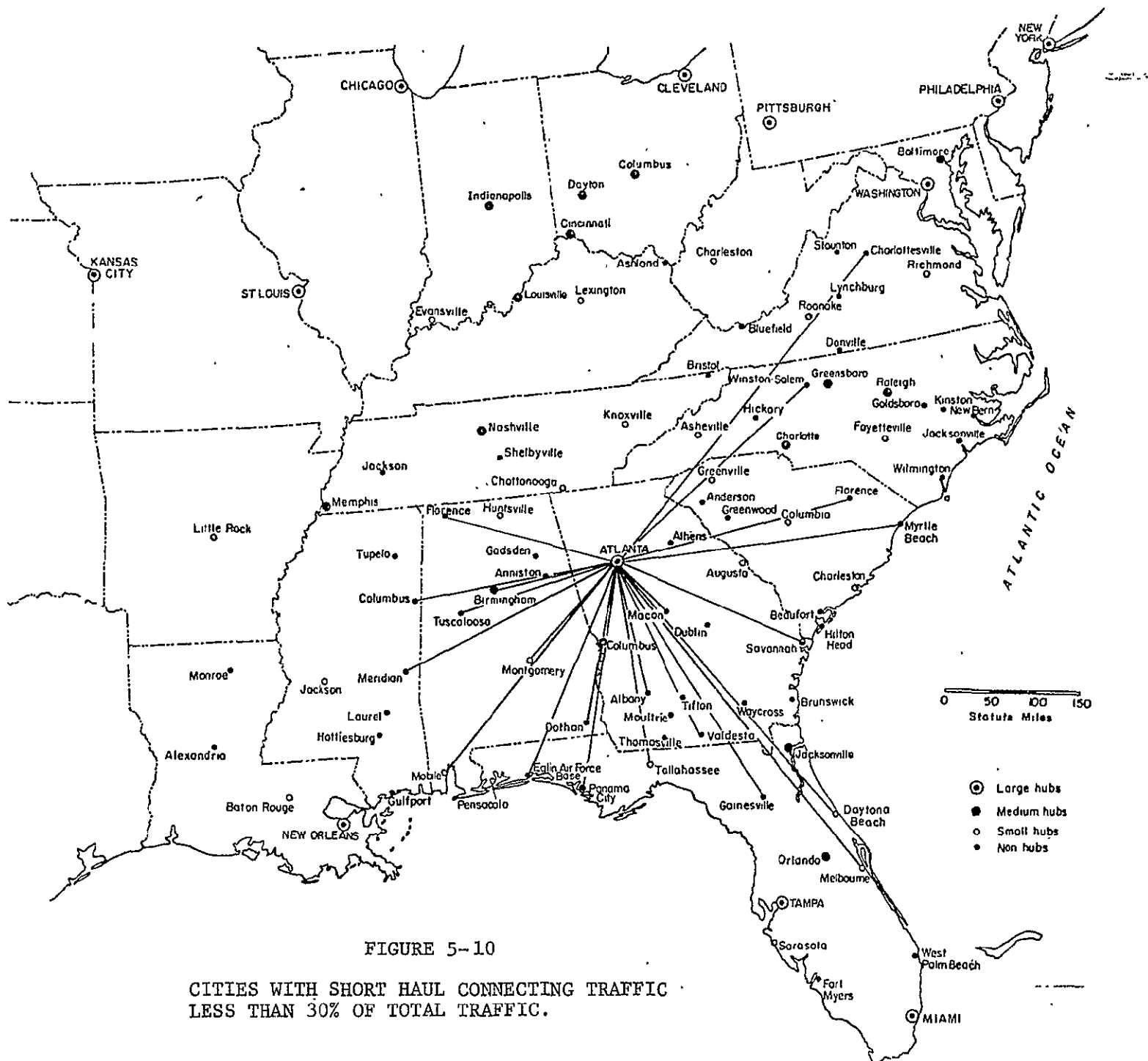


FIGURE 5-10

CITIES WITH SHORT HAUL CONNECTING TRAFFIC  
LESS THAN 30% OF TOTAL TRAFFIC.

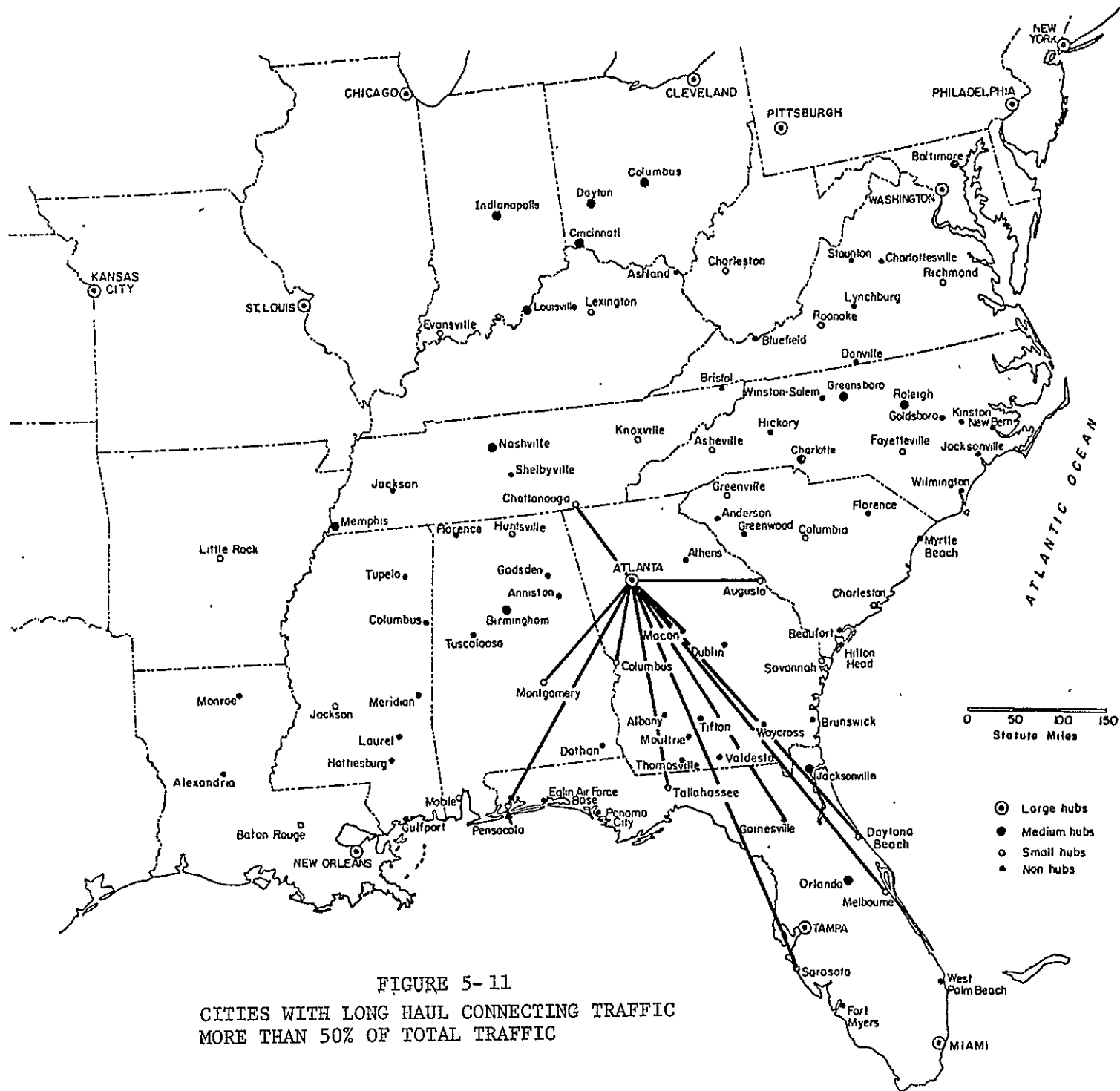


FIGURE 5-11  
CITIES WITH LONG HAUL CONNECTING TRAFFIC  
MORE THAN 50% OF TOTAL TRAFFIC

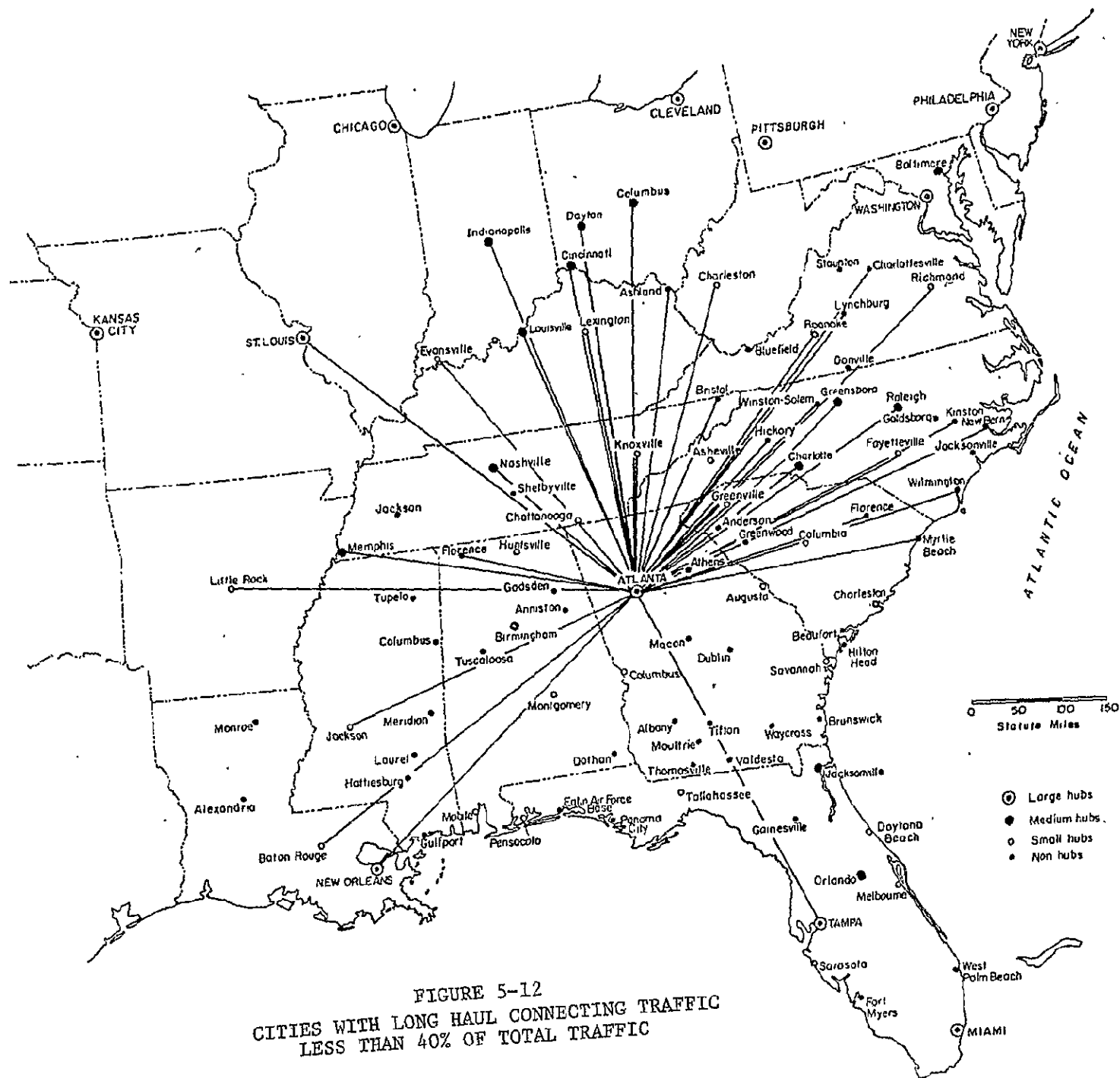


FIGURE 5-12  
CITIES WITH LONG HAUL CONNECTING TRAFFIC  
LESS THAN 40% OF TOTAL TRAFFIC

Traffic Distributions by State: In looking at the traffic summaries on a state by state basis in Tables 5-5 and 5-6, the tendency for concentration appears again. In fact, three states: Florida, North Carolina, and Tennessee account for close to 50% of all the short haul traffic at Atlanta. Florida alone generates close to 30% of total O-D traffic, as well as of total connecting traffic at Atlanta airport, more than three times as much as Georgia accounts for.

Total Traffic at Atlanta Airport: The total short haul traffic at Atlanta airport is summarized in Table 5-7. The summary is made with four classifications: 1) Origin Destination passengers; 2) Passengers originating at or destined for Atlanta, but connecting at the other trip end; 3) Passengers connecting with short haul flights at Atlanta; and finally, 4) passengers connecting to long haul flights at Atlanta. The reason for this classification stems, again, from the interest in looking at the implications of a dedicated short haul system. The first three groups, accounting for 53.5% of the total, or 5.2 million Passengers in 1974, indicate the potential use of a dedicated short haul airport serving a short haul system centered on Atlanta.

However, when looking at connecting traffic it appears that there are twice as many connections to long haul flights than to short haul flights, 46.3% versus 22.5%. This indicates the need for a careful assessment of the impact of establishing a dedicated short haul system in the region. Problems of schedule allocation between a short haul airport and the original long haul airport would need to be dealt with. Furthermore, of the short haul connections at Atlanta, some traffic would probably be diverted to direct service within

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TABLE 5-5

Breakdown of Short Haul Passenger Traffic at Atlanta, by States

| State          | Total Traffic                       |                             | O-D Traffic     |                                 | # of Passengers Originating or Terminating at Atlanta (Not including O-D traffic) | Connecting Traffic at Atlanta |                                        |
|----------------|-------------------------------------|-----------------------------|-----------------|---------------------------------|-----------------------------------------------------------------------------------|-------------------------------|----------------------------------------|
|                | # of Passengers to and from Atlanta | # of All Traffic at Atlanta | # of Passengers | # of All O-D Traffic at Atlanta |                                                                                   | # of Passengers               | % of All Connecting Traffic at Atlanta |
| Florida        | 3,455,000                           | 29.3                        | 681,840         | 24.8                            | 32,930                                                                            | 2,740,230                     | 31.1                                   |
| North Carolina | 1,218,970                           | 10.3                        | 387,330         | 14.1                            | 27,460                                                                            | 804,180                       | 9.1                                    |
| Tennessee      | 1,145,830                           | 9.7                         | 329,990         | 12.0                            | 77,020                                                                            | 738,820                       | 8.4                                    |
| Alabama        | 1,139,590                           | 9.6                         | 246,750         | 9.0                             | 13,530                                                                            | 879,310                       | 10.0                                   |
| Georgia        | 974,000                             | 8.3                         | 172,800         | 6.3                             | 8,320                                                                             | 792,880                       | 9.0                                    |
| South Carolina | 880,370                             | 7.5                         | 168,590         | 6.1                             | 12,650                                                                            | 699,130                       | 7.9                                    |
| Louisiana      | 665,630                             | 5.6                         | 150,880         | 5.5                             | 16,660                                                                            | 498,090                       | 5.6                                    |
| Ohio           | 656,530                             | 5.6                         | 143,690         | 5.2                             | 7,120                                                                             | 505,720                       | 5.7                                    |
| Kentucky       | 406,100                             | 3.4                         | 106,680         | 3.9                             | 7,890                                                                             | 291,530                       | 3.3                                    |
| Mississippi    | 298,330                             | 2.5                         | 87,280          | 3.2                             | 3,010                                                                             | 208,040                       | 2.4                                    |
| Indiana        | 297,030                             | 2.5                         | 64,220          | 2.3                             | 2,010                                                                             | 230,800                       | 2.6                                    |
| Virginia       | 283,430                             | 2.4                         | 95,010          | 3.5                             | 6,740                                                                             | 181,680                       | 2.1                                    |
| Missouri       | 263,900                             | 2.2                         | 74,030          | 2.7                             | 43,390                                                                            | 146,480                       | 1.7                                    |
| W. Virginia    | 85,760                              | 0.7                         | 16,900          | 0.6                             | 1,280                                                                             | 67,580                        | 0.8                                    |
| Arkansas       | 44,550                              | 0.4                         | 21,700          | 0.8                             | 600                                                                               | 22,250                        | 0.3                                    |
| TOTAL          | 11,815,020                          | 100.0                       | 2,747,690       | 100.0                           | 260,610                                                                           | 8,806,720*                    | 100.0                                  |

Notes: 1. Data is from the Civil Aeronautics Board Origin-Destination Survey for 1974

2. All passenger figures are for two way traffic

3. Where part of a state is within 500 miles of Atlanta, passenger figures are for that part of the state only.

\*This total includes a double count of shorthaul/short haul connecting passengers and is only used for the purpose of determining state % contributions to connecting traffic at Atlanta.

TABLE 5-6

State Contributions to Long Haul and Short Haul  
Connecting Traffic at Atlanta

| States         | # of<br>Total<br>Passengers<br>to and<br>from<br>Atlanta | Short Haul/Long Haul<br>Connecting Traffic |                                                              | Short Haul/Short Haul<br>Connecting Traffic |                                                               |
|----------------|----------------------------------------------------------|--------------------------------------------|--------------------------------------------------------------|---------------------------------------------|---------------------------------------------------------------|
|                |                                                          | # of<br>Passengers                         | % of All<br>Long Haul<br>Connecting<br>Traffic at<br>Atlanta | # of<br>Passengers                          | % of All<br>Short Haul<br>Connecting<br>Traffic at<br>Atlanta |
| Florida        | 3,455,000                                                | 1,559,760                                  | 34.9                                                         | 1,180,470                                   | 27.2                                                          |
| North Carolina | 1,218,970                                                | 359,940                                    | 8.1                                                          | 444,240                                     | 10.2                                                          |
| Tennessee      | 1,145,830                                                | 304,530                                    | 6.8                                                          | 434,290                                     | 10.0                                                          |
| Alabama        | 1,139,590                                                | 551,120                                    | 12.3                                                         | 328,190                                     | 7.6                                                           |
| Georgia        | 974,000                                                  | 420,940                                    | 11.7                                                         | 271,940                                     | 6.3                                                           |
| South Carolina | 880,370                                                  | 382,450                                    | 8.6                                                          | 316,680                                     | 7.3                                                           |
| Louisiana      | 665,630                                                  | 239,040                                    | 5.4                                                          | 259,050                                     | 6.0                                                           |
| Ohio           | 656,530                                                  | 152,220                                    | 3.4                                                          | 353,500                                     | 8.1                                                           |
| Kentucky       | 406,100                                                  | 101,730                                    | 2.3                                                          | 189,800                                     | 4.4                                                           |
| Mississippi    | 298,330                                                  | 109,160                                    | 2.4                                                          | 98,880                                      | 2.3                                                           |
| Indiana        | 297,030                                                  | 60,990                                     | 1.4                                                          | 169,810                                     | 3.9                                                           |
| Virginia       | 283,430                                                  | 64,910                                     | 1.5                                                          | 116,770                                     | 2.7                                                           |
| Missouri       | 263,900                                                  | 24,460                                     | 0.5                                                          | 122,020                                     | 2.8                                                           |
| West Virginia  | 85,760                                                   | 28,620                                     | 0.6                                                          | 38,960                                      | 0.9                                                           |
| Arkansas       | 44,550                                                   | 6,680                                      | 0.1                                                          | 15,570                                      | 0.3                                                           |
| TOTAL          | 11,815,020                                               | 4,466,550                                  | 100.0                                                        | 4,340,170*                                  | 100.0                                                         |

- Notes: 1. Data is from the Civil Aeronautics Board Origin-Destination Survey for 1974.  
 2. All passenger figures are for two way traffic.  
 3. Where part of a state is within 500 miles of Atlanta passenger figures are for that part of the state only.

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\*This total double counts short haul/short haul connecting passengers and is only used for the purpose of determining state % contributions to short haul/short haul connecting traffic.

TABLE 5-7

TOTAL TRAFFIC AT ATLANTA GENERATED IN THE SHORT HAUL REGION

| <i>PASSENGER CATEGORIES</i>                                                            | <i># OF PASSENGERS</i> | <i>PERCENTAGE OF TOTAL</i> |
|----------------------------------------------------------------------------------------|------------------------|----------------------------|
| <i>Total passengers to or from Atlanta, for all cities included in the study.</i>      | 9,644,940              | 100.0                      |
| <i>O-D passengers.</i>                                                                 | 2,747,690              | 28.5                       |
| <i>Passengers terminating or initiating at Atlanta (not including O-D passengers).</i> | 260,610                | 2.7                        |
| <i>Passengers connecting to or from other flights at Atlanta.</i>                      | 6,636,640              | 68.8                       |
| <i>Passengers connecting to or from long haul flights at Atlanta.</i>                  | 4,466,550              | 46.3                       |
| <i>Passengers connecting to or from short haul flights at Atlanta.</i>                 | 2,170,090              | 22.5                       |

NOTE:

- (1) Data is from the Civil Aeronautics Board Origin-Destination Survey for 1974.



the region if a short haul system is established that would increase the direct connectivity between the cities. The patterns of traffic between the cities of the region is the subject of a later chapter in this report.

Connections by Length of Haul: Table 5-8 summarizes the short haul connections at Atlanta on the basis of mileage block. If one adds the mileages of the two legs of a connecting journey and assumes that to be an approximate measure of the overall trip length, then it is interesting to note that only 13% of the total connecting trips have trip lengths under 500 miles. The Table shows the predominance of connections between flights serving the cities at the larger distances from Atlanta. What this might indicate after more careful scrutiny is that many of the so-called short haul trips are in fact longer haul trips but need to be made on a short haul system due to the lack of direct connections. In any case, this type of result serves to shed further doubts on the validity of a strict definition of short haul air transportation in terms of a specific upper bound on trip length such as 500 miles.

#### Temporal Patterns of Short Haul Traffic

##### (a) Hourly variations at Atlanta.

Atlanta International airport's hourly passenger deplanement and enplanements are shown in Figure 5-13. This data was not available for 1974; the data for an average day in August 1973 is accepted as typical of the pattern in 1974. As can be seen, the peaks of deplanements generally precede those of enplanements by one hour and the pattern is continued throughout the day and night except for the hours of 1 to 4 am.

TABLE 5-8

PASSENGER CONNECTIONS BETWEEN MILEAGE BLOCKS, AT ATLANTA\*

| From all cities in mileage blocks included in the study in mileage blks. | 0-100           | 100-200          | 200-300          | 300-400          | 400-500           | TOTAL             |
|--------------------------------------------------------------------------|-----------------|------------------|------------------|------------------|-------------------|-------------------|
| 0 - 100                                                                  | 0<br>(0)        | 15390<br>(0.3)   | 20460<br>(0.5)   | 29140<br>(0.7)   | 36970<br>(0.8)    | 101960<br>(2.3)   |
| 100 - 200                                                                | 23600<br>(0.5)  | 114110<br>(2.7)  | 148720<br>(3.4)  | 171700<br>(3.9)  | 299140<br>(6.9)   | 757270<br>(17.4)  |
| 200 - 300                                                                | 26360<br>(0.6)  | 144880<br>(3.3)  | 155440<br>(3.6)  | 228740<br>(5.3)  | 292680<br>(6.7)   | 848100<br>(19.5)  |
| 300 - 400                                                                | 33680<br>(0.8)  | 176450<br>(4.1)  | 244780<br>(5.6)  | 181710<br>(4.2)  | 385320<br>(8.9)   | 1021940<br>(23.6) |
| 400 - 500                                                                | 50520<br>(1.3)  | 306310<br>(7.0)  | 307180<br>(7.1)  | 387380<br>(8.9)  | 559510<br>(12.9)  | 1610900<br>(37.2) |
| TOTAL                                                                    | 134160<br>(3.2) | 757140<br>(17.4) | 876580<br>(20.2) | 998670<br>(23.0) | 1573620<br>(36.2) | 4340170<br>(100)  |

\*The number in the parentheses is the percentage of traffic in each cell of the total S.H. connecting traffic.

6-2

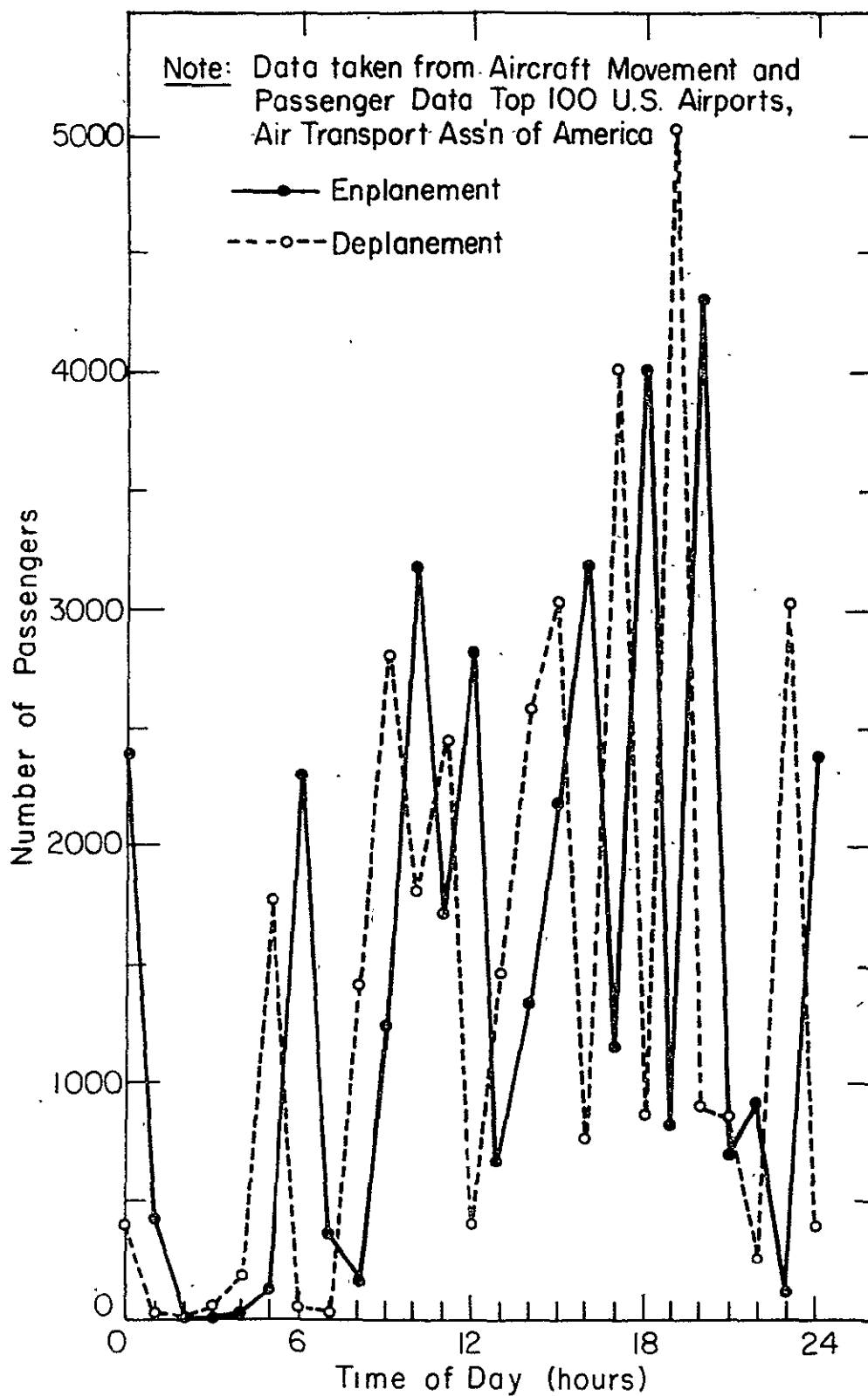


FIG. 5-13 ENPLANEMENTS AND DEPLANEMENTS AT ATLANTA INTERNATIONAL AIRPORT ON AN AVERAGE DAY IN AUGUST, 1973

This pattern is not observed at other major airports and several contributory factors combine to cause it to happen at Atlanta. Firstly, because of congestion, the aircraft movements are scheduled more evenly throughout the day. Secondly, arrivals and departures are scheduled to provide convenient connections for the large proportion of connecting passengers at Atlanta.

The daily pattern of short haul and long haul flights separately has not been obtained. It would be of interest to determine whether short haul/short haul connecting flights exhibit any particular pattern.

(b) Seasonal Variations

Passenger data from CAB O-D Survey is available on a quarterly basis. Atlanta traffic with typical cities of the region is presented in Table 5-9 for the four quarters of 1974 and 1975. Percentage variations above or below the quarterly average for the year are also given.

Traffic in the second quarter of the year is higher than the average in every case. Variations from the average are different from year to year and from city to city. For the cities presented here, variations range from 16.1% below to 11.4% above average.

TABLE 5-9

## SEASONAL VARIATION OF TRAFFIC TO ATLANTA FROM TYPICAL CITIES IN THE STUDY

| City           | Year<br>quarter | 1973             |                 |                 |                 | 1974             |                 |                 |                 |
|----------------|-----------------|------------------|-----------------|-----------------|-----------------|------------------|-----------------|-----------------|-----------------|
|                |                 | 1                | 2               | 3               | 4               | 1                | 2               | 3               | 4               |
| Orlando, FL    |                 | 72320<br>(-8.4)  | 83690<br>(6.0)  | 78230<br>(-0.9) | 81620<br>(3.3)  | 96140<br>(0.7)   | 104130<br>(9.1) | 93600<br>(-1.8) | 87750<br>(-8.0) |
| Charlotte, NC  |                 | 40290<br>(-8.5)  | 44970<br>(2.0)  | 43600<br>(-1.0) | 47400<br>(7.5)  | 49800<br>(2.2)   | 52900<br>(8.5)  | 47250<br>(-3.0) | 44940<br>(-7.7) |
| Savannah, GA   |                 | 29680<br>(-14.1) | 36800<br>(6.5)  | 35790<br>(3.5)  | 36000<br>(4.1)  | 34780<br>(-16.1) | 44200<br>(6.6)  | 46190<br>(11.4) | 40630<br>(-1.9) |
| Louisville, KY |                 | 33040<br>(-3.6)  | 37640<br>(9.7)  | 32020<br>(-6.6) | 34490<br>(0.5)  | 31900<br>(-5.6)  | 37520<br>(11.0) | 33460<br>(-1.0) | 32320<br>(-4.4) |
| St. Louis, MO  |                 | 30160<br>(-6.9)  | 36010<br>(11.1) | 33360<br>(3.0)  | 30060<br>(-7.2) | 29250<br>(-10.1) | 34600<br>(6.3)  | 33540<br>(3.0)  | 32840<br>(0.8)  |
| Raleigh, NC    |                 | 28540<br>(-8.8)  | 32260<br>(3.0)  | 31560<br>(0.8)  | 32910<br>(5.0)  | 34300<br>(9.7)   | 31340<br>(0.3)  | 30420<br>(-2.6) | 28910<br>(-7.4) |

## NOTE:

1. Passenger data is from the Civil Aeronautics Board Origin-Destination Survey.
2. All passenger figures are for total one-way traffic.
3. Numbers in the parentheses are the percentage variations above (or below) the quarterly average of the year and city-pair.

## 6. COMPARISON OF ATLANTA TRAFFIC AND SERVICE PATTERNS

### Introduction

In this chapter, Atlanta short haul traffic is compared with the pattern of air service connecting the city with the rest of the short haul region. Total traffic on each service between a city and Atlanta is compared to the available service capacity in the city pair. This is in contrast to the comparison made in Chapter 4 between origin-destination traffic and available capacity. While the latter comparison may be used to indicate how city pair demands are being served, the comparison made in this chapter would indicate how the available air service in the region is being utilized. As in previous chapter total traffic in this analysis includes only origin destination traffic and connecting traffic, and does not include through traffic. However, for a subset of the cities in the region a look is taken in this chapter at through trip patterns in order to further assess the importance of this data for the analysis at hand. In addition, this chapter includes some analysis of traffic and service patterns stratified by service areas of specific carriers. A look is also taken at some routes operating by one carrier, Piedmont Airlines, as an example of the type of analysis that can be done on that basis.

### Local Utilization Factors

The term Local Utilization Factor is used to denote the ratio of the origin destination and connecting traffic on a particular service between two cities, to the total available seats on that service. Average load factor would differ from this ratio in that it would include through traffic. Thus, the local utilization factor may be used as an indication of the extent

to which service in a particular market is being utilized by the local traffic in that market. Local utilization ratios are derived for the air services connecting Atlanta with the 72 short haul cities in the region. Table 6-1 shows these ratios together with service frequency and traffic volumes for each city. Service frequency is based on the total number of weekly flights between Atlanta and the city in question, including both non-stop flights and flights with stops. A tendency is observed in the Table for the local utilization ratio to decline with the magnitude of the traffic volume. To illustrate this tendency, Figure 6-1 is presented showing the ratio graphically for the short haul cities plotted in descending order of traffic volume. Despite the considerable variations it can be seen that there is a general decreasing trend of the utilization ratio with traffic volume. This general tendency is not surprising, as it can be expected that cities with lower traffic volumes would not be served with as many dedicated flights but would constitute enroute stops of multistop flights and would therefore have a considerable amount of 'non-local' traffic utilizing the service.

There are some interesting exceptions to the general trend of the local utilization ratios. Gainesville, a non-hub with a relatively low traffic volume shows a ratio of close to 89%. On the other hand there are several major markets that exhibit low utilization ratios. In particular, there are Memphis, Cincinnati, Columbus, Louisville, and St. Louis, all with traffic volumes in excess of 200,000 but having utilization ratios under 35%. While further analysis would be needed to explain these phenomena some early inferences are possible. For example, in the case of these high volume cities, it can be seen that they are all to the North and West of Atlanta and all at

TABLE 6-1

LOCAL TRAFFIC COMPARED TO SUPPLY  
BETWEEN ATLANTA AND ALL CITIES IN THE STUDY

| <u>State</u><br><u>City</u> | <u>Hub</u><br><u>Size</u> | <u>Supply</u><br><u>(frequency)</u> | <u>% of</u><br><u>non-stop</u><br><u>flights</u> | <u>Local</u><br><u>traffic</u> | <u>Local uti-</u><br><u>lization</u><br><u>ratio</u> | <u>Carriers</u><br><u>providing</u><br><u>service</u> |
|-----------------------------|---------------------------|-------------------------------------|--------------------------------------------------|--------------------------------|------------------------------------------------------|-------------------------------------------------------|
| <u>Florida</u>              |                           |                                     |                                                  |                                |                                                      |                                                       |
| Tampa                       | L                         | H                                   | 92                                               | 821170                         | 38.0                                                 | DL EA NW UA                                           |
| Orlando                     | M                         | H                                   | 92                                               | 780220                         | 49.1                                                 | DL EA                                                 |
| Jacksonville                | M                         | H                                   | 95                                               | 632660                         | 43.3                                                 | DL EA SO UA                                           |
| Daytonna Beach              | S                         | M                                   | 69                                               | 234690                         | 43.7                                                 | EA                                                    |
| Pensacola                   | S                         | M                                   | 46                                               | 199290                         | 47.4                                                 | EA                                                    |
| Sarasota                    | S                         | M                                   | 100                                              | 183620                         | 48.8                                                 | EA                                                    |
| Tallahassee                 | S                         | M                                   | 83                                               | 173700                         | 36.3                                                 | EA SO                                                 |
| Melbourne                   | S                         | M                                   | 67                                               | 159150                         | 32.1                                                 | EA                                                    |
| Gainesville                 | N                         | M                                   | 100                                              | 108380                         | 88.6                                                 | EA                                                    |
| Eglin A.F. Base             | N                         | M                                   | 20                                               | 80470                          | 39.5                                                 | SO                                                    |
| Panama City                 | N                         | M                                   | 25                                               | 70680                          | 43.3                                                 | SO                                                    |
| <u>North Carolina</u>       |                           |                                     |                                                  |                                |                                                      |                                                       |
| Charlotte                   | M                         | H                                   | 88                                               | 392140                         | 48.0                                                 | DL EA                                                 |
| Raleigh                     | M                         | M                                   | 85                                               | 253240                         | 50.2                                                 | EA UA                                                 |
| Greensboro                  | M                         | M                                   | 100                                              | 199280                         | 47.6                                                 | EA                                                    |
| Asheville                   | S                         | M                                   | 100                                              | 114970                         | 21.8                                                 | PI UA                                                 |
| Fayetteville                | S                         | M                                   | 81                                               | 103740                         | 22.2                                                 | PI                                                    |
| Wilmington                  | N                         | M                                   | 71                                               | 40200                          | 13.7                                                 | PI                                                    |
| Jacksonville                | N                         | L                                   | 61                                               | 32810                          | 17.8                                                 | PI                                                    |
| Kinston                     | N                         | M                                   | 14                                               | 20920                          | 8.9                                                  | PI                                                    |
| Winston-Salem               | N                         | M                                   | 13                                               | 20460                          | 8.3                                                  | PI                                                    |
| Hickory                     | N                         | L                                   | 79                                               | 17300                          | 18.2                                                 | PI                                                    |
| New Bern                    | N                         | L                                   | 0                                                | 16390                          | 18.8                                                 | PI                                                    |
| <u>Tennessee</u>            |                           |                                     |                                                  |                                |                                                      |                                                       |
| Memphis                     | M                         | H                                   | 67                                               | 379940                         | 29.7                                                 | DL EA SO                                              |
| Nashville                   | M                         | H                                   | 94                                               | 246570                         | 61.0                                                 | EA SO                                                 |
| Knoxville                   | S                         | H                                   | 76                                               | 218920                         | 47.2                                                 | DL                                                    |
| Chattanooga                 | S                         | H                                   | 100                                              | 206690                         | 51.7                                                 | DL EA                                                 |
| Bristol                     | N                         | M                                   | 82                                               | 88120                          | 25.6                                                 | PI                                                    |
| <u>Alabama</u>              |                           |                                     |                                                  |                                |                                                      |                                                       |
| Birmingham                  | M                         | H                                   | 100                                              | 452760                         | 38.8                                                 | DL UA SO EA                                           |
| Montgomery                  | S                         | H                                   | 87                                               | 227360                         | 43.0                                                 | DL EA                                                 |
| Mobile                      | S                         | H                                   | 74                                               | 203970                         | 52.7                                                 | EA SO                                                 |
| Huntsville                  | S                         | M                                   | 81                                               | 142720                         | 67.4                                                 | SO                                                    |



TABLE 6-1 (continued)

| State<br>City          | Hub<br>Size | Supply<br>(frequency) | % of<br>non-stop<br>flights | Local<br>traffic              | Local uti-<br>lization<br>ratio | Carriers<br>providing<br>service |
|------------------------|-------------|-----------------------|-----------------------------|-------------------------------|---------------------------------|----------------------------------|
| <u>Alabama (cont.)</u> |             |                       |                             |                               |                                 |                                  |
| Dothan                 | N           | M                     | 80                          | 73270                         | 37.1                            | SO                               |
| Tuscaloosa             | N           | M                     | 85                          | 34800                         | 28.1                            | SO                               |
| Muscle Shoals          | N           | L                     | 0                           | 3890                          | 4.8                             | SO                               |
| <u>Georgia</u>         |             |                       |                             |                               |                                 |                                  |
| Savannah               | S           | H                     | 74                          | 327750                        | 57.0                            | DL                               |
| Augusta                | S           | H                     | 100                         | 220540                        | 37.8                            | DL PI                            |
| Columbus               | S           | H                     | 100                         | 181550                        | 42.3                            | DL EA SO                         |
| Macon                  | N           | M                     | 100                         | 130200                        | 45.6                            | EA DL                            |
| Albany                 | N           | M                     | 100                         | 76270                         | 50.6                            | SO                               |
| Brunswick              | N           | M <sup>†</sup>        | 42                          | 57825 <sup>†</sup><br>+ 11220 | 34.3 <sup>†</sup>               | KQ                               |
| Valdosta               | N           | L                     | 15                          | 25280                         | 32.0                            | SO                               |
| Waycross               | N           | L <sup>†</sup>        | 100                         | 7571 <sup>†</sup><br>+ 1150   | 11.7 <sup>†</sup>               | KQ                               |
| <u>South Carolina</u>  |             |                       |                             |                               |                                 |                                  |
| Columbia               | S           | H                     | 72                          | 385710                        | 52.9                            | DL SO PI                         |
| Charleston             | S           | H                     | 37                          | 265840                        | 56.7                            | DL SO                            |
| Greenville             | S           | M                     | 93                          | 163960                        | 31.1                            | SO EA                            |
| Florence               | N           | M                     | 100                         | 28980                         | 16.9                            | PI                               |
| Myrtle Beach           | N           | L                     | 34                          | 26890                         | 21.0                            | PI                               |
| Hilton Head            | N           | M <sup>†</sup>        | 74                          | 15070 <sup>†</sup><br>+ 7540  | 19.8 <sup>†</sup>               | KQ                               |
| Beaufort               | N           | L <sup>†</sup>        | 0                           | 4056 <sup>†</sup><br>+ 700    | 20.0 <sup>†</sup>               | KQ                               |
| <u>Louisiana</u>       |             |                       |                             |                               |                                 |                                  |
| New Orleans            | L           | H                     | 64                          | 526030                        | 40.2                            | DL EA SO                         |
| Baton Rouge            | S           | M                     | 67                          | 66050                         | 54.0                            | DL                               |
| Monroe                 | N           | M                     | 14                          | 37160                         | 20.5                            | DL                               |
| Alexandria             | N           | L                     | 0                           | 30170                         | 29.6                            | DL                               |
| <u>Ohio</u>            |             |                       |                             |                               |                                 |                                  |
| Cincinnati             | M           | H                     | 48                          | 247120                        | 26.0                            | DL                               |
| Columbus               | M           | H                     | 28                          | 218790                        | 32.1                            | DL EA PI                         |
| Dayton                 | M           | M                     | 92                          | 187610                        | 50.0                            | DL                               |
| <u>Kentucky</u>        |             |                       |                             |                               |                                 |                                  |
| Louisville             | M           | H                     | 84                          | 280010                        | 34.1                            | DL EA                            |
| Lexington              | S           | M                     | 44                          | 115160                        | 47.4                            | DL                               |
| Ashland                | N           | L                     | 0                           | 6960                          | 22.8                            | PI                               |

TABLE 6-1 (continued)

| State<br>City        | Hub<br>Size | Supply<br>(frequency) | % of<br>non-stop<br>flights | Local<br>traffic | Local uti-<br>lization<br>ratio | Carriers<br>providing<br>service |
|----------------------|-------------|-----------------------|-----------------------------|------------------|---------------------------------|----------------------------------|
| <u>Mississippi</u>   |             |                       |                             |                  |                                 |                                  |
| Jackson              | S           | H                     | 35                          | 190480           | 25.1                            | DL SO                            |
| Gulfport             | N           | M                     | 0                           | 48260            | 29.6                            | SO                               |
| Meridian             | N           | L                     | 35                          | 34380            | 29.5                            | SO DL                            |
| Columbus             | N           | L                     | 0                           | 23290            | 24.1                            | SO                               |
| <u>Indiana</u>       |             |                       |                             |                  |                                 |                                  |
| Indianapolis         | M           | H                     | 54                          | 255270           | 35.3                            | DL EA                            |
| Evansville           | S           | L                     | 100                         | 36230            | 30.5                            | EA                               |
| <u>Virginia</u>      |             |                       |                             |                  |                                 |                                  |
| Richmond             | S           | M                     | 100                         | 170140           | 39.0                            | EA                               |
| Roanoke              | S           | M                     | 17                          | 86580            | 18.3                            | PI                               |
| Lynchburg            | N           | L                     | 0                           | 13140            | 8.3                             | PI                               |
| Charlottesville      | N           | L                     | 0                           | 8500             | 5.8                             | PI                               |
| <u>Missouri</u>      |             |                       |                             |                  |                                 |                                  |
| St. Louis            | L           | H                     | 86                          | 261980           | 32.0                            | DL EA TW                         |
| <u>West Virginia</u> |             |                       |                             |                  |                                 |                                  |
| Charleston           | S           | M                     | 44                          | 85360            | 30.9                            | PI UA                            |
| <u>Arkansas</u>      |             |                       |                             |                  |                                 |                                  |
| Little Rock          | S           | L                     | 0                           | 27980            | 43.7                            | DL                               |

† Passengers carried by Commuter Carriers

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TABLE 6-1 (continued)

| <u>State</u><br><u>City</u> | Hub<br>Size | Supply<br>(frequency) | % of<br>non-stop<br>flights | Local<br>traffic | Local uti-<br>lization<br>ratio | Carriers<br>providing<br>service |
|-----------------------------|-------------|-----------------------|-----------------------------|------------------|---------------------------------|----------------------------------|
| <u>Mississippi</u>          |             |                       |                             |                  |                                 |                                  |
| Jackson                     | S           | H                     | 35                          | 190480           | 25.1                            | DL SO                            |
| Gulfport                    | N           | M                     | 0                           | 48260            | 29.6                            | SO                               |
| Meridian                    | N           | L                     | 35                          | 34380            | 29.5                            | SO DL                            |
| Columbus                    | N           | L                     | 0                           | 23290            | 24.1                            | SO                               |
| <u>Indiana</u>              |             |                       |                             |                  |                                 |                                  |
| Indianapolis                | M           | H                     | 54                          | 255270           | 35.3                            | DL EA                            |
| Evansville                  | S           | L                     | 100                         | 36230            | 30.5                            | EA                               |
| <u>Virginia</u>             |             |                       |                             |                  |                                 |                                  |
| Richmond                    | S           | M                     | 100                         | 170140           | 39.0                            | EA                               |
| Roanoke                     | S           | M                     | 17                          | 86580            | 18.3                            | PI                               |
| Lynchburg                   | N           | L                     | 0                           | 13140            | 8.3                             | PI                               |
| Charlottesville             | N           | L                     | 0                           | 8500             | 5.8                             | PI                               |
| <u>Missouri</u>             |             |                       |                             |                  |                                 |                                  |
| St. Louis                   | L           | H                     | 86                          | 261980           | 32.0                            | DL EA TW                         |
| <u>West Virginia</u>        |             |                       |                             |                  |                                 |                                  |
| Charleston                  | S           | M                     | 44                          | 85360            | 30.9                            | PI UA                            |
| <u>Arkansas</u>             |             |                       |                             |                  |                                 |                                  |
| Little Rock                 | S           | L                     | 0                           | 27980            | 43.7                            | DL                               |

† Passengers carried by Commuter Carriers

TABLE 6-1 (continued)

| State<br>City          | Hub<br>Size | Supply<br>(frequency) | % of<br>non-stop<br>flights | Local<br>traffic              | Local uti-<br>lization<br>ratio | Carriers<br>providing<br>service |
|------------------------|-------------|-----------------------|-----------------------------|-------------------------------|---------------------------------|----------------------------------|
| <u>Alabama (cont.)</u> |             |                       |                             |                               |                                 |                                  |
| Dothan                 | N           | M                     | 80                          | 73270                         | 37.1                            | SO                               |
| Tuscaloosa             | N           | M                     | 85                          | 34800                         | 28.1                            | SO                               |
| Muscle Shoals          | N           | L                     | 0                           | 3890                          | 4.8                             | SO                               |
| <u>Georgia</u>         |             |                       |                             |                               |                                 |                                  |
| Savannah               | S           | H                     | 74                          | 327750                        | 57.0                            | DL                               |
| Augusta                | S           | H                     | 100                         | 220540                        | 37.8                            | DL PI                            |
| Columbus               | S           | H                     | 100                         | 181550                        | 42.3                            | DL EA SO                         |
| Macon                  | N           | M                     | 100                         | 130200                        | 45.6                            | EA DL                            |
| Albany                 | N           | M                     | 100                         | 76270                         | 50.6                            | SO                               |
| Brunswick              | N           | M <sup>†</sup>        | 42                          | 57825 <sup>†</sup><br>+ 11220 | 34.3 <sup>†</sup>               | KQ                               |
| Valdosta               | N           | L                     | 15                          | 25280                         | 32.0                            | SO                               |
| Waycross               | N           | L <sup>†</sup>        | 100                         | 7571 <sup>†</sup><br>+ 1150   | 11.7 <sup>†</sup>               | KQ                               |
| <u>South Carolina</u>  |             |                       |                             |                               |                                 |                                  |
| Columbia               | S           | H                     | 72                          | 385710                        | 52.9                            | DL SO PI                         |
| Charleston             | S           | H                     | 37                          | 265840                        | 56.7                            | DL SO                            |
| Greenville             | S           | M                     | 93                          | 163960                        | 31.1                            | SO EA                            |
| Florence               | N           | M                     | 100                         | 28980                         | 16.9                            | PI                               |
| Myrtle Beach           | N           | L                     | 34                          | 26890                         | 21.0                            | PI                               |
| Hilton Head            | N           | M <sup>†</sup>        | 74                          | 15070 <sup>†</sup><br>+ 7540  | 19.8 <sup>†</sup>               | KQ                               |
| Beaufort               | N           | L <sup>†</sup>        | 0                           | 4056 <sup>†</sup><br>+ 700    | 20.0 <sup>†</sup>               | KQ                               |
| <u>Louisiana</u>       |             |                       |                             |                               |                                 |                                  |
| New Orleans            | L           | H                     | 64                          | 526030                        | 40.2                            | DL EA SO                         |
| Baton Rouge            | S           | M                     | 67                          | 66050                         | 54.0                            | DL                               |
| Monroe                 | N           | M                     | 14                          | 37160                         | 20.5                            | DL                               |
| Alexandria             | N           | L                     | 0                           | 30170                         | 29.6                            | DL                               |
| <u>Ohio</u>            |             |                       |                             |                               |                                 |                                  |
| Cincinnati             | M           | H                     | 48                          | 247120                        | 26.0                            | DL                               |
| Columbus               | M           | H                     | 28                          | 218790                        | 32.1                            | DL EA PI                         |
| Dayton                 | M           | M                     | 92                          | 187610                        | 50.0                            | DL                               |
| <u>Kentucky</u>        |             |                       |                             |                               |                                 |                                  |
| Louisville             | M           | H                     | 84                          | 280010                        | 34.1                            | DL EA                            |
| Lexington              | S           | M                     | 44                          | 115160                        | 47.4                            | DL                               |
| Ashland                | N           | L                     | 0                           | 6960                          | 22.8                            | PI                               |

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distances in excess of 300 miles from it.

This indicates the increasing opportunity of intermediate stops enroute between Atlanta and these cities. For instance, the proportion of non-stop flights is 28% for Columbus, Ohio; and 48% for Cincinnati, Ohio (Table 6-1). Furthermore, the sizes of these hubs (medium and large) indicate that they are likely to be stops on the route of flights between Atlanta and major cities outside the region. Indeed, investigation of through passengers presented later in this Section shows that these cities do have high percentages of through passengers. A combination of these two effects produces the low ratios.

#### Analysis of Some Through Traffic Patterns

As mentioned earlier in this report, through traffic data were not compiled from the CAB sources used to compile local traffic data. However, it was possible to acquire 1973 through traffic data for 26 of the major short haul cities in the study area from an Air Transport Association data source<sup>(1)</sup>. In this reference, local traffic as defined in this study is referred to as enplanements and deplanements. Table 6-2 shows through traffic in comparison to enplanements and deplanements for the cities in the region and for Atlanta.

Generally, it can be seen that the percentages of through traffic are higher at the short haul cities than they are at Atlanta. This is an expected tendency since Atlanta is the major hub of the region and acts as a major connecting station rather than a through station, for the region. The percentages of through traffic are generally low. They are rather high, however, at the cities to the North, e.g. St. Louis and the Ohio cities.

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(1) Air Transport Association of America: Aircraft Movement and Passenger Data for an Average Day in August, 1973 (Washington, D.C., May 1975)

TABLE 6-2

## 1973 THROUGH TRAFFIC FOR SHORT HAUL CITIES WITH ATLANTA

| STATE<br>City         | Hub<br>Size | Nonstop<br>flight<br>% of<br>total<br>flights | Local<br>Utilization<br>Ratio (1974)<br>% | Ratio of Thru Pax. to<br>Enplanement & Deplanement |                   |
|-----------------------|-------------|-----------------------------------------------|-------------------------------------------|----------------------------------------------------|-------------------|
|                       |             |                                               |                                           | At Specified City<br>(%)                           | At Atlanta<br>(%) |
| <u>FLORIDA</u>        |             |                                               |                                           |                                                    |                   |
| Tampa                 | L           | 92                                            | 38.0                                      | 3.3                                                | 19.9              |
| Orlando               | M           | 92                                            | 49.1                                      | 2.2                                                | 14.7              |
| Jacksonville          | M           | 95                                            | 43.3                                      | 12.7                                               | 8.2               |
| Sarasota              | S           | 100                                           | 48.8                                      | 0.3                                                | 15.8              |
| <u>NORTH CAROLINA</u> |             |                                               |                                           |                                                    |                   |
| Charlotte             | M           | 88                                            | 48.0                                      | 19.7                                               | 8.7               |
| Raleigh               | M           | 85                                            | 50.2                                      | 7.4                                                | 6.7               |
| Greensboro            | M           | 100                                           | 47.6                                      | 8.1                                                | 11.0              |
| <u>TENNESSEE</u>      |             |                                               |                                           |                                                    |                   |
| Memphis               | M           | 67                                            | 29.7                                      | 12.3                                               | 6.8               |
| Nashville             | M           | 94                                            | 61.0                                      | 4.6                                                | 4.2               |
| Knoxville             | S           | 76                                            | 47.2                                      | 37.5                                               | 4.9               |
| <u>ALABAMA</u>        |             |                                               |                                           |                                                    |                   |
| Birmingham            | M           | 100                                           | 38.8                                      | 28.6                                               | 11.2              |
| Mobile                | S           | 74                                            | 52.7                                      | 14.5                                               | 2.6               |
| Huntsville            | S           | 81                                            | 67.4                                      | 20.4                                               | 0                 |
| <u>SOUTH CAROLINA</u> |             |                                               |                                           |                                                    |                   |
| Columbia              | S           | 72                                            | 52.9                                      | 26.8                                               | 4.9               |
| Charleston            | S           | 37                                            | 56.7                                      | 0                                                  | 3.1               |
| <u>LOUISIANA</u>      |             |                                               |                                           |                                                    |                   |
| New Orleans           | L           | 64                                            | 40.2                                      | 4.4                                                | 16.1              |
| <u>OHIO</u>           |             |                                               |                                           |                                                    |                   |
| Cincinnati            | M           | 48                                            | 26.0                                      | 29.9                                               | 12.9              |
| Columbus              | M           | 28                                            | 32.1                                      | 34.7                                               | 11.5              |
| Dayton                | M           | 92                                            | 50.0                                      | 66.9                                               | 9.8               |
| <u>KENTUCKY</u>       |             |                                               |                                           |                                                    |                   |
| Louisville            | M           | 84                                            | 34.1                                      | 25.3                                               | 12.5              |
| <u>MISSISSIPPI</u>    |             |                                               |                                           |                                                    |                   |
| Jackson               | S           | 35                                            | 25.1                                      | 53.9                                               | 13.7              |
| <u>INDIANA</u>        |             |                                               |                                           |                                                    |                   |
| Indianapolis          | M           | 54                                            | 35.3                                      | 12.6                                               | 13.3              |
| <u>VIRGINIA</u>       |             |                                               |                                           |                                                    |                   |
| Richmond              | S           | 100                                           | 39.0                                      | 12.3                                               | 4.4               |
| Roanoke               | S           | 17                                            | 18.3                                      | 37.8                                               | 0                 |
| <u>MISSOURI</u>       |             |                                               |                                           |                                                    |                   |
| St. Louis             | L           | 86                                            | 32.0                                      | 21.6                                               | 3.8               |
| <u>WEST VIRGINIA</u>  |             |                                               |                                           |                                                    |                   |
| Charleston            | S           | 44                                            | 30.9                                      | 8.5                                                | 5.9               |

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Referring back to the earlier discussion concerning the lower utilization ratios of these Northern large hubs, the high through trip percentages are not unexpected.

Considerably more analysis is needed than is performed here in order to clarify the meanings of all these patterns, and to infer some understanding about the structure of the short haul network and its effect on trip patterns. However, with the low through trip proportions, and the low local utilization ratios prevalent in the study region, it is possible to conclude that there are no capacity constraints and that local short haul demands are adequately served by the existing system, at least from the standpoint of available seats. Whether the connectivity of the service network is such that passengers have to undergo excessively circuitous routes between their origins and destination remains to be seen after a look at the origin destination patterns of traffic between all the short haul cities in the region, which is the subject of the next chapter.

In an attempt to highlight the geographical differences in through trip patterns, Figures 6-2 and 6-3 are presented. They show the proportions of the total traffic between the short haul cities and Atlanta constituted by through traffic. It can be seen that Atlanta city pairs in the North have low through trip proportions at the cities and higher ratios at Atlanta, and that the reverse is true for cities in the South. Again the presence of more major hubs outside the region to the north than to the south may serve as an explanation for this pattern.



FIGURE 6-2

THROUGH TRIP PATTERNS AT ATLANTA

NOTE:

Through passengers are given as percentages of enplanements and deplanements at Atlanta.



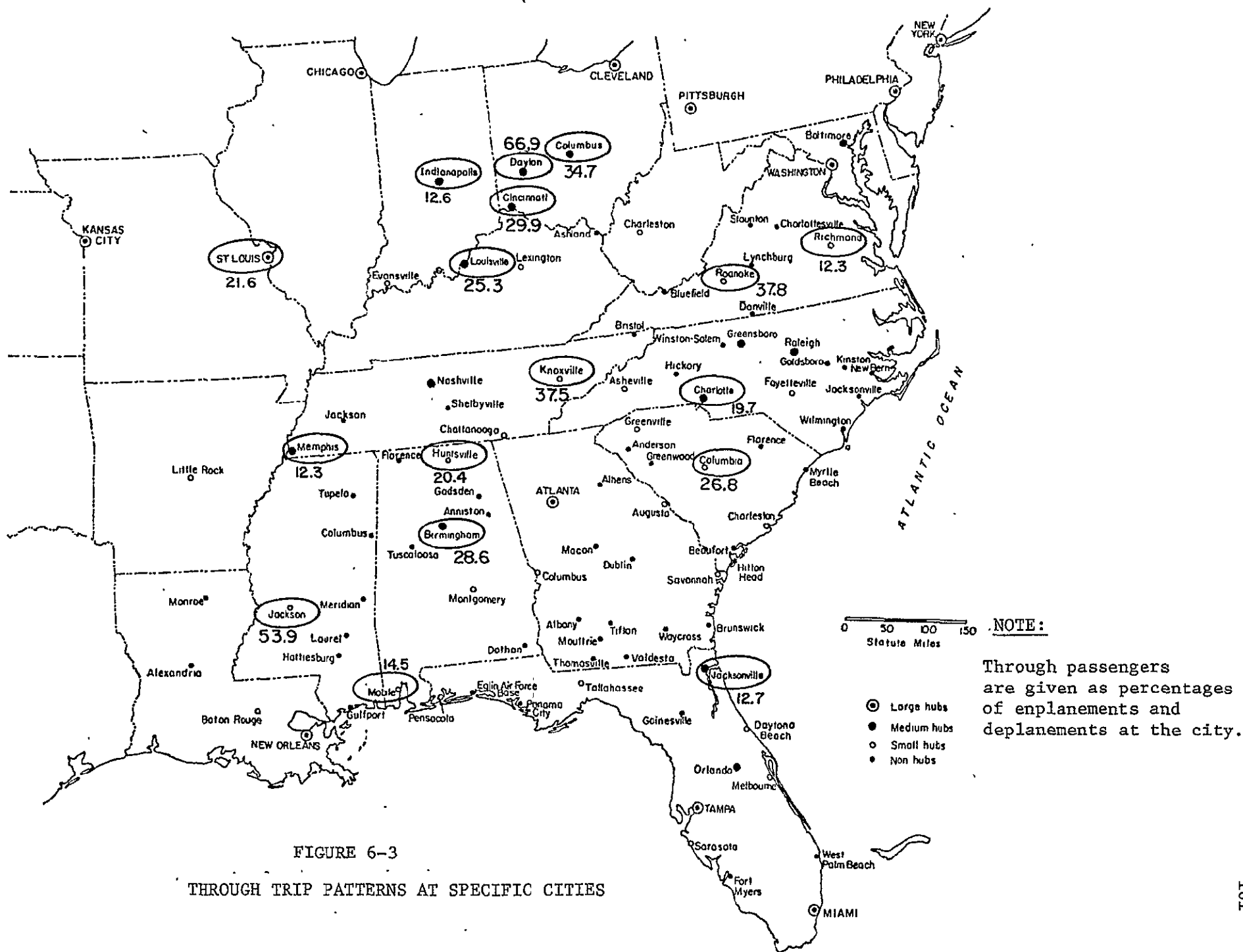


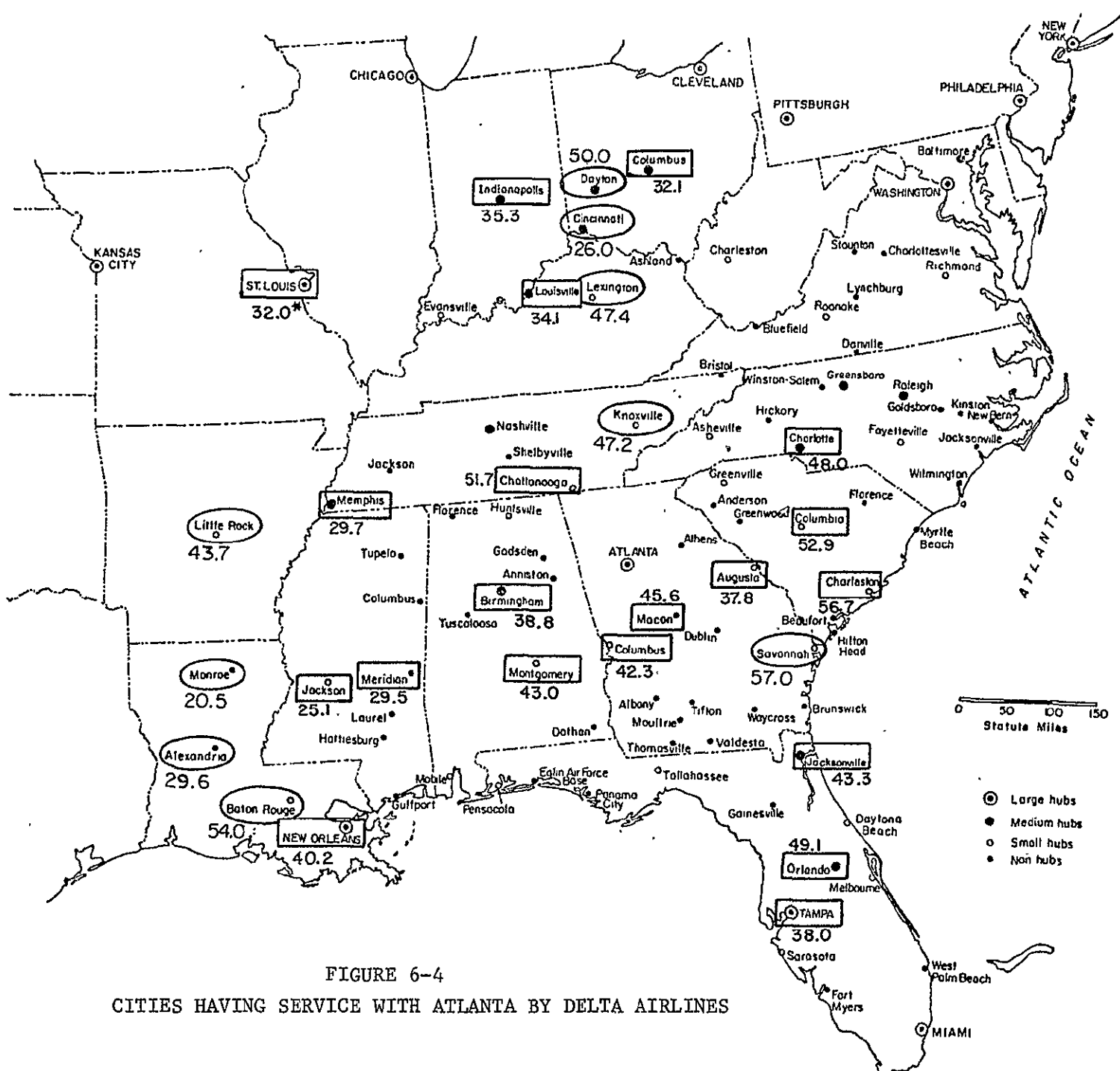
FIGURE 6-3  
THROUGH TRIP PATTERNS AT SPECIFIC CITIES

### Patterns for Individual Carriers

Referring back to Table 6-1, it can be seen that some cities in the region are connected with Atlanta by service of a single carrier, while others are served by two or more carriers. In an attempt to trace any difference in the patterns based on this distinction, a characterization is presented in this section of the service patterns of each of the air carriers in the region.

There are four principal carriers serving the Atlanta short haul region. Two are domestic trunk carriers: Delta and Eastern; and two are regional carriers: Southern and Piedmont. These carriers have different but overlapping market areas. As shown in Figures 6-4 through 6-7, Delta and Eastern have markets spread out over the whole study region with Delta absent from the northeastern corner; Piedmont serves the northeastern sector of the region and Southern the southern and southwestern sectors. About half the cities in the region are served by a single carrier and the rest by two or more carriers, including all the major markets. Table 6-3 shows some of the features of the market areas for each of the carriers. It can be seen that the larger hubs are served mainly by the trunks and the small hubs by the regional carriers. With the larger hubs generating more of their traffic than the smaller ones, it can be expected that the local utilization factors for the trunks would be higher than the rest, a tendency which can in fact be detected in Table 6-1.

The service patterns of the carriers in the study region are compared in Table 6-4. It is seen in that table that the number of flights offered by the trunks is higher than by the regional carriers. However, the number of cities served by the regional carriers is larger. Specifically, it can be



Numbers are the local utilization ratios

- Hubs served by multiple carriers
- Hubs served by a single carrier
- Large hubs
- Medium hubs
- Small hubs
- Non hubs

\* Service by Delta not significant compared to other carriers

FIGURE 6-4  
CITIES HAVING SERVICE WITH ATLANTA BY DELTA AIRLINES

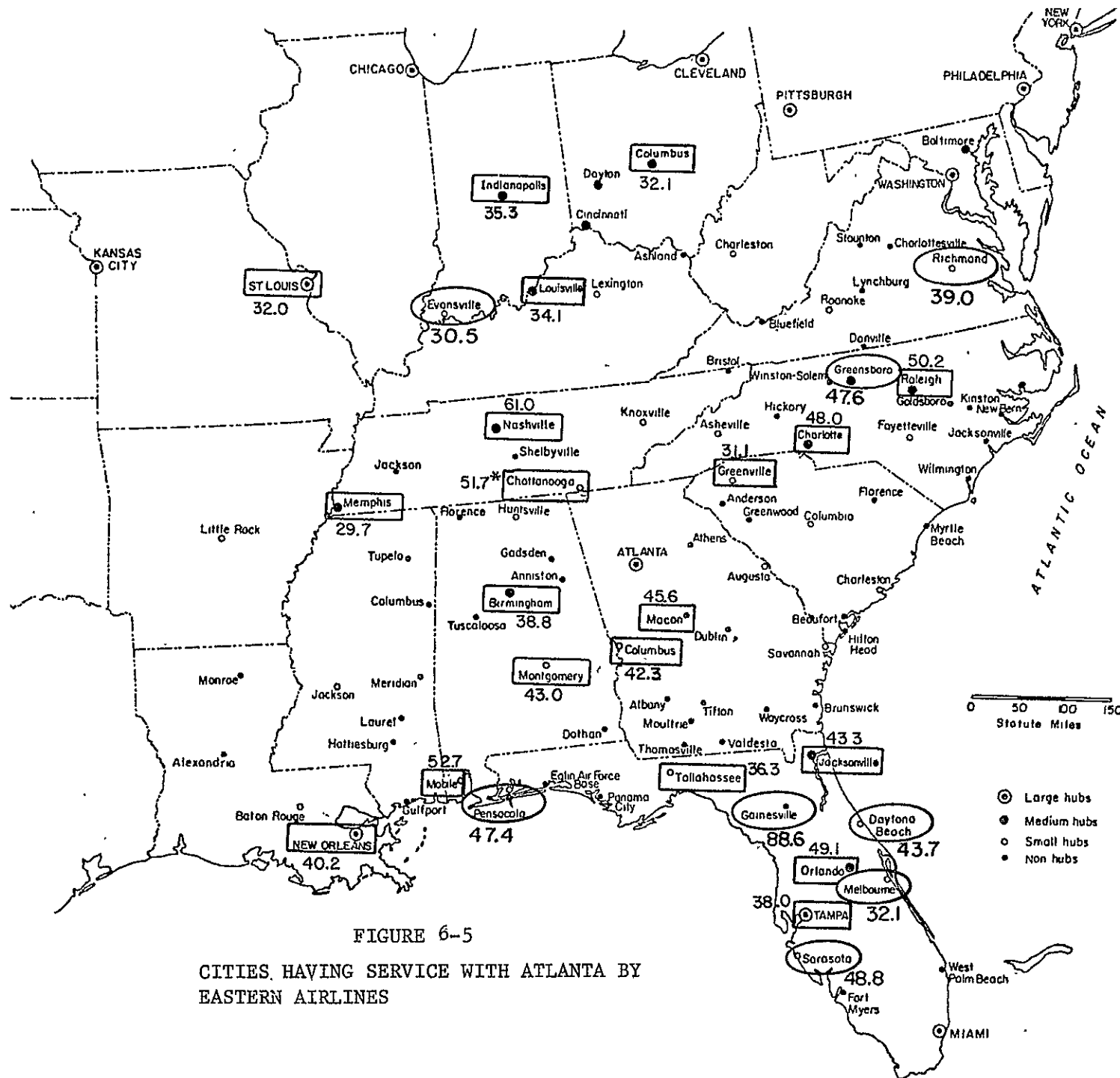


FIGURE 6-5

CITIES, HAVING SERVICE WITH ATLANTA BY  
EASTERN AIRLINES



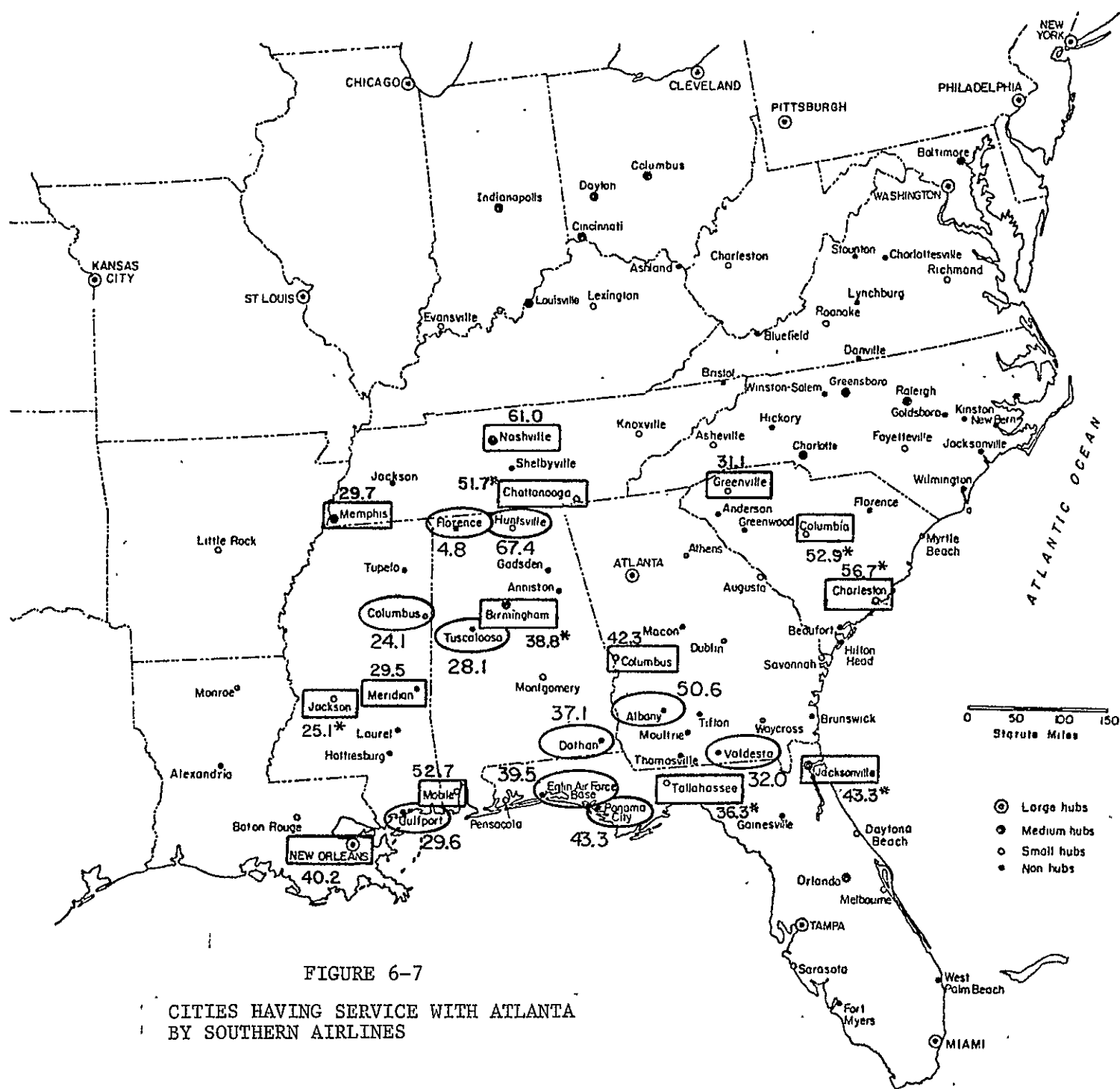


FIGURE 6-7  
CITIES HAVING SERVICE WITH ATLANTA  
BY SOUTHERN AIRLINES

Numbers are the local utilization ratios

Hubs served by multiple carriers  
Hubs served by a single carrier

\* Service by Southern not significant compared to other carriers

TABLE 6-3  
SUMMARY OF SERVICE BY FOUR AIR CARRIERS

| Air Carrier | Figure | Total # of Cities Served | # of Cities |            |           |         | Comments                                                                                                                                                                            |
|-------------|--------|--------------------------|-------------|------------|-----------|---------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|             |        |                          | Large Hub   | Medium Hub | Small Hub | Non-Hub |                                                                                                                                                                                     |
| Delta       | 6-4    | 29                       | 3           | 10         | 12        | 4       | Three non-hubs are:<br>Meridan, MS<br>Alexandria, LA<br>Macon, GA.<br>Monroe, LA                                                                                                    |
| Eastern     | 6-5    | 28                       | 3           | 11         | 12        | 2       | Most active in Florida.<br>Two non-hubs are:<br>Gainesville, FL<br>Macon, GA                                                                                                        |
| Piedmont    | 6-6    | 19                       | 0           | 1          | 6         | 12      | Active in the north-east part of the region.<br>The medium hub is Columbus, OH, of which Piedmont has only 10% market share.                                                        |
| Southern    | 6-7    | 24                       | 1           | 4          | 9         | 10      | Very active in the southwest part of the region.<br>The large hub is New Orleans, LA<br>Four medium hubs are:<br>Birmingham, AL<br>Jacksonville, FL<br>Memphis, TN<br>Nashville, TN |

TABLE 6-4

## SERVICE PATTERNS OF DAILY INBOUND FLIGHTS TO ATLANTA FROM SHORT HAUL CITIES

| AIR<br>CARRIER | TOTAL<br># OF<br>FLIGHTS | FLIGHTS SERVING (ENROUTE TO ATLANTA) |               |                 |               |                              |               | Flights<br>terminating<br>at Atlanta<br>% of Total | Flights<br>Initiating<br>with S.H.<br>Boundary<br>% of Total | FLEET<br>MIX                                |
|----------------|--------------------------|--------------------------------------|---------------|-----------------|---------------|------------------------------|---------------|----------------------------------------------------|--------------------------------------------------------------|---------------------------------------------|
|                |                          | ONE S.H. CITY                        |               | TWO S.H. CITIES |               | MORE THAN<br>TWO S.H. CITIES |               |                                                    |                                                              |                                             |
|                |                          | # of<br>Flights                      | % of<br>Total | # of<br>Flights | % of<br>Total | # of<br>Flights              | % of<br>Total |                                                    |                                                              |                                             |
| Delta          | 134                      | 90                                   | 67            | 36              | 27            | 8                            | 6             | 33                                                 | 55                                                           | DC-8 12%<br>DC-9 56%<br>B727 24%<br>L-10 8% |
| Eastern        | 116                      | 103                                  | 89            | 13              | 11            | 0                            | 0             | 24                                                 | 72                                                           | DC-9 54%<br>B727 43%<br>L-10 3%             |
| Piedmont       | 30                       | 8                                    | 27            | 16              | 53            | 6                            | 20            | 100                                                | 23                                                           | B737 60%<br>Namco<br>YS11 33%<br>F227 7%    |
| Southern       | 34                       | 11                                   | 32            | 14              | 41            | 9                            | 27            | 91                                                 | 94                                                           | DC9 70%<br>Martin<br>404 30%                |



seen that the proportion of the flights serving more than one city in the region, on the way to Atlanta is 33% for Delta, 11% for Eastern, 73% for Piedmont and 68% for Southern. The cities served by the regional carriers are generally smaller than the rest and generate less traffic. Consequently, the route structures are designed for the typical flight to serve a series of smaller cities between two larger hubs. Because of this, the local utilization ratios are lower for the regionals than they are for the trunks. This pattern is best observed in the Northeastern sector of the study region.

In the Northeast there are 12 hubs and 12 non-hubs. The latter exhibit considerably lower local utilization ratios than the former. The non-hubs are served by the regional carriers, and the hubs by the trunks, predominantly Eastern. Since the Piedmont Airlines service in the Northeastern sector of the study area approximates that of a dedicated short haul system, a more detailed look is taken at that network.

#### Service Pattern of Piedmont Airlines

Piedmont serves the cities shown in Figure 6-8 with 30 inbound flights to Atlanta. Table 6-5 shows the itineraries of these flights which provide 58 connections between the 19 cities in the northeastern sector and Atlanta. Of these flights only 7 originate within the study region. Of the rest, 9 originate in New York City and 11 in Washington, D.C. As can be seen from Table 6-5, most flights make at least 2 stops in total flight itineraries, of which the longest is 755 miles. Only two of the flights are non-stop. While the outbound flights from Atlanta do not reflect exactly the pattern of the inbound flights, most of them do terminate in the Washington, D.C. or New York City areas. Typical flight itineraries are shown in Figure 6-9. With the



TABLE 6-5  
 PIEDMONT AIRLINES FLIGHT ITINERARIES  
 SERVING 19 CITIES TO THE NE OF ATLANTA

| Flight # | Flight Itinerary           | # of stops between<br>origin and destination<br>of the flight |
|----------|----------------------------|---------------------------------------------------------------|
| 1        | LGA ROA TRI ATL            | 2                                                             |
| 5        | FAY ATL                    | 0                                                             |
| 9        | DCA FAY ATL                | 1                                                             |
| 11       | DCA ROA INT ATL            | 2                                                             |
| 29       | ORF ISO FLO ATL            | 2                                                             |
| 33       | LGA ISO FAY ATL            | 2                                                             |
| 35       | INT AVL ATL                | 1                                                             |
| 37       | DCA ROA AVL ATL            | 2                                                             |
| 39       | DCA ROA TRI ATL            | 2                                                             |
| 43       | EWR IAD OAJ ATL            | 2                                                             |
| 45       | EWR ORF OAJ ATL            | 2                                                             |
| 49       | LGA ROA TRI AVL ATL        | 3                                                             |
| 55       | DCA FAY ATL                | 1                                                             |
| 57       | LGA ROA TRI ATL            | 2                                                             |
| 59       | EWR ORF FAY ATL            | 2                                                             |
| 61       | ORF DCA CRW AVL ATL        | 3                                                             |
| 73       | EWR CHO LYH AVL ATL        | 3                                                             |
| 79       | LGA ORF ILM ATL            | 2                                                             |
| 210      | MDW HTS CRW TRI ATL        | 3                                                             |
| 241      | DCA LYH DAN HKY ATL        | 3                                                             |
| 901      | ILM CRE FLO ATL            | 2                                                             |
| 905      | DCA EWN FLO ATL            | 2                                                             |
| 909      | DCA ISO ILM CRE ATL        | 3                                                             |
| 911      | ILM CRE AGS ATL            | 2                                                             |
| 921      | DCA ISO GSB FLO ATL        | 3                                                             |
| 925      | DCA EWN CRE ATL            | 2                                                             |
| 943      | INT HKY ATL                | 1                                                             |
| 946      | CMH PKB BLF TRI ATL        | 3                                                             |
| 953      | DCA ORF GSB CAE AGS<br>ATL | 4                                                             |
| 975      | AVL ATL                    | 0                                                             |

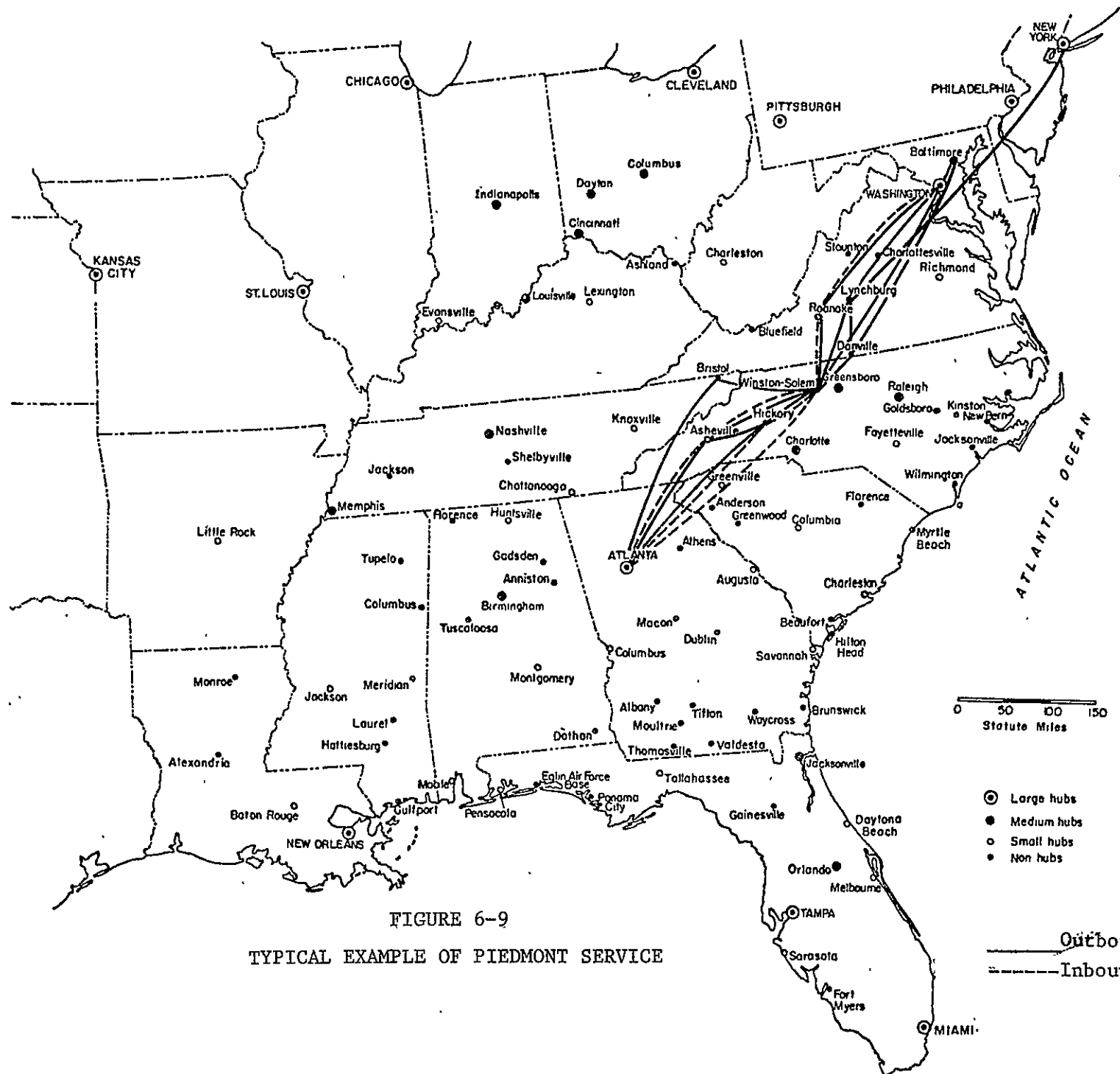


FIGURE 6-9  
TYPICAL EXAMPLE OF PIEDMONT SERVICE

fleet mix of Piedmont as shown in Table 6-4, the local utilization factor for the services in the Northeastern sector is calculated to be 31%. This means that in order to make these services economically feasible, the carrier must depend on traffic generated by the major hubs outside the region, of which there are a number in the Northeast. Comparatively, Southern Airlines which serves the southern and southwestern sectors of the region have a service pattern with 94% of the flights originating within the region and consequently a much larger overall local utilization factor. Clearly, the absence of any major hubs to the outside of the region in the southwest may be a reason for this. Furthermore, there is a different fleet mix between the two carriers, Piedmont's Boeing 737 and Namco US-11 aircraft have generally higher seat capacities than Southern's McDonnell-Douglas DC-9's and Martin 404's. This would result in lower utilization factors for the same number of flights.

At this point it becomes necessary to take a look at the interaction between cities within the region and major hubs just outside it. This, together with the traffic and service patterns between the cities of the region themselves are the subjects of the next chapter.

## 7. CITY-PAIR TRAFFIC AND SERVICE PATTERNS

### Introduction

While this study is mainly concerned with the interaction of the short haul region's traffic with the major hub Atlanta, it is believed essential for the overall objectives of the study to take a look at the traffic and service patterns between the region's cities themselves. In this chapter the origin destination patterns of the cities in the region are summarized. A look is then taken at the service networks connecting these cities. Finally, for some selected cities comparisons are made between total traffic and origin destination traffic on the one hand, and service patterns on the other.

### Origin Destination Patterns

A summarization of all origin destination traffic for the hubs of the region is presented in Table 7-1. In that table a distinction is made between cities closer than 500 miles and cities farther than that distance. The majority of the city pairs are in fact closer than that distance. However, a closer look at the distribution of distance between city pairs might reveal some interesting implications for short haul technology requirements.

High volume city pairs (origin destination traffic in excess of 20,000 annually,) are extracted from the table for further analysis. The origin destination patterns for these cities are shown on Figure 7-1 -- 7-8 categorized geographically and on the basis of traffic volume levels. There are a total of 48 city pairs with volumes over 20,000. Of these, 33 are closer than 500 miles.

TABLE 7-1  
ORIGIN-DESTINATION PASSENGER DATA FOR TRAVEL BETWEEN LARGE, MEDIUM AND SMALL HUBS

| CITY                 | CITY | 1    | 2    | 3    | 4     | 5    | 6    | 7     | 8    | 9    | 10   | 11   | 12   | 13   | 14   | 15   | 16 |
|----------------------|------|------|------|------|-------|------|------|-------|------|------|------|------|------|------|------|------|----|
| 1. Asheville, NC     |      | 2149 | 16   | 57   | 226   | 35   | 134  | 292   | 61   | 398  | 5    | 38   | 151  | 111  | 105  | 11   |    |
| 2. Atlanta, GA       |      |      | 2692 | 1884 | 10329 | 5123 | 1752 | 12892 | 1744 | 5905 | 7264 | 1876 | 5065 | 4035 | 3522 | 1093 |    |
| 3. Augusta, GA       |      |      |      | 84   | 348   | 93   | 70   | 362   | 175  | 267  | 39   | 205  | 405  | 207  | 27   | 40   |    |
| 4. Baton Rouge, LA   |      |      |      |      | 405   | 103  | 30   | 156   | 139  | 137  | 139  | 67   | 74   | 116  | 16   | 42   |    |
| 5. Birmingham, AL    |      |      |      |      |       | 496  | 127  | 1296  | 109  | 1009 | 576  | 106  | 533  | 391  | 139  | 112  |    |
| 6. Charleston, SC    |      |      |      |      |       |      | 128  | 1533  | 269  | 522  | 218  | 261  | 438  | 315  | 109  | 85   |    |
| 7. Charleston, WV    |      |      |      |      |       |      |      | 235   | 55   | 1145 | 85   | 48   | 204  | 46   | 153  | 14   |    |
| 8. Charlotte, NC     |      |      |      |      |       |      |      |       | 1999 | 828  | 494  | 342  | 1660 | 356  | 313  | 84   |    |
| 9. Chattanooga, TN   |      |      |      |      |       |      |      |       |      | 755  | 322  | 126  | 302  | 291  | 146  | 11   |    |
| 10. Cincinnati, OH   |      |      |      |      |       |      |      |       |      |      | 721  | 234  | 419  | 131  | 687  | 296  |    |
| 11. Columbia, SC     |      |      |      |      |       |      |      |       |      |      |      | 294  | 526  | 493  | 47   | 51   |    |
| 12. Columbus, GA     |      |      |      |      |       |      |      |       |      |      |      |      | 174  | 176  | 34   | 30   |    |
| 13. Columbus, OH     |      |      |      |      |       |      |      |       |      |      |      |      |      | 246  | 473  | 395  |    |
| 14. Dayton, OH       |      |      |      |      |       |      |      |       |      |      |      |      |      |      | 271  | 162  |    |
| 15. Daytona Bch., FL |      |      |      |      |       |      |      |       |      |      |      |      |      |      |      | 65   |    |
| 16. Evansville, IN   |      |      |      |      |       |      |      |       |      |      |      |      |      |      |      |      |    |
| 17. Fayetteville, NC |      |      |      |      |       |      |      |       |      |      |      |      |      |      |      |      |    |
| 18. Greensboro, NC   |      |      |      |      |       |      |      |       |      |      |      |      |      |      |      |      |    |
| 19. Greenville, SC   |      |      |      |      |       |      |      |       |      |      |      |      |      |      |      |      |    |
| 20. Huntsville, AL   |      |      |      |      |       |      |      |       |      |      |      |      |      |      |      |      |    |
| 21. Indianapolis, IN |      |      |      |      |       |      |      |       |      |      |      |      |      |      |      |      |    |
| 22. Jackson, MS      |      |      |      |      |       |      |      |       |      |      |      |      |      |      |      |      |    |
| 23. Jacksonville, FL |      |      |      |      |       |      |      |       |      |      |      |      |      |      |      |      |    |
| 24. Knoxville, TN    |      |      |      |      |       |      |      |       |      |      |      |      |      |      |      |      |    |
| 25. Lexington, KY    |      |      |      |      |       |      |      |       |      |      |      |      |      |      |      |      |    |
| 26. Little Rock, AR  |      |      |      |      |       |      |      |       |      |      |      |      |      |      |      |      |    |
| 27. Louisville, KY   |      |      |      |      |       |      |      |       |      |      |      |      |      |      |      |      |    |
| 28. Melbourne, FL    |      |      |      |      |       |      |      |       |      |      |      |      |      |      |      |      |    |
| 29. Memphis, TN      |      |      |      |      |       |      |      |       |      |      |      |      |      |      |      |      |    |
| 30. Mobile, AL       |      |      |      |      |       |      |      |       |      |      |      |      |      |      |      |      |    |
| 31. Montgomery, AL   |      |      |      |      |       |      |      |       |      |      |      |      |      |      |      |      |    |
| 32. Nashville, TN    |      |      |      |      |       |      |      |       |      |      |      |      |      |      |      |      |    |
| 33. New Orleans, LA  |      |      |      |      |       |      |      |       |      |      |      |      |      |      |      |      |    |
| 34. Orlando, FL      |      |      |      |      |       |      |      |       |      |      |      |      |      |      |      |      |    |
| 35. Pensacola, FL    |      |      |      |      |       |      |      |       |      |      |      |      |      |      |      |      |    |
| 36. Raleigh, NC      |      |      |      |      |       |      |      |       |      |      |      |      |      |      |      |      |    |
| 37. Richmond, VA     |      |      |      |      |       |      |      |       |      |      |      |      |      |      |      |      |    |
| 38. Roanoke, VA      |      |      |      |      |       |      |      |       |      |      |      |      |      |      |      |      |    |
| 39. Sarasota, FL     |      |      |      |      |       |      |      |       |      |      |      |      |      |      |      |      |    |
| 40. Savannah, GA     |      |      |      |      |       |      |      |       |      |      |      |      |      |      |      |      |    |
| 41. St. Louis, MO    |      |      |      |      |       |      |      |       |      |      |      |      |      |      |      |      |    |
| 42. Tallahassee, FL  |      |      |      |      |       |      |      |       |      |      |      |      |      |      |      |      |    |
| 43. Tampa, FL        |      |      |      |      |       |      |      |       |      |      |      |      |      |      |      |      |    |

NOTE:

- Source is Civil Aeronautics Board Origin-Destination Survey of Airline Passenger Traffic, Domestic 1974, Table 8, "Domestic City Pair Summary; City Pairs Arranged Alphabetically".
- Data is a 10% sample.
- Numbers in italics are for city pairs more than 500 miles apart (LH city pairs).

TABLE 7-1 (continued)

| CITY                 | 17   | 18   | 19   | 20   | 21   | 22   | 23    | 24   | 25   | 26   | 27   | 28   | 29    | 30   | 31   | 32   |
|----------------------|------|------|------|------|------|------|-------|------|------|------|------|------|-------|------|------|------|
| 1. Asheville, NC     | 150  | 111  | 8    | 59   | 141  | 93   | 406   | 79   | 85   | 56   | 345  | 92   | 340   | 72   | 56   | 438  |
| 2. Atlanta, GA       | 2485 | 7144 | 2712 | 3313 | 5574 | 6222 | 14865 | 5493 | 2866 | 2336 | 7592 | 1834 | 13318 | 4976 | 3417 | 9979 |
| 3. Augusta, GA       | 31   | 122  | 3    | 79   | 328  | 141  | 244   | 233  | 94   | 77   | 380  | 44   | 475   | 135  | 130  | 270  |
| 4. Baton Rouge, LA   | 12   | 71   | 61   | 52   | 115  | 62   | 148   | 181  | 76   | 282  | 165  | 27   | 1008  | 101  | 74   | 361  |
| 5. Birmingham, AL    | 161  | 527  | 377  | 9    | 544  | 1886 | 2134  | 720  | 302  | 402  | 1027 | 88   | 3033  | 3731 | 115  | 1089 |
| 6. Charleston, SC    | 40   | 414  | 48   | 195  | 549  | 311  | 878   | 298  | 183  | 177  | 594  | 41   | 732   | 350  | 384  | 500  |
| 7. Charleston, WV    | 75   | 243  | 57   | 32   | 180  | 181  | 373   | 76   | 16   | 48   | 325  | 168  | 209   | 55   | 58   | 198  |
| 8. Charlotte, NC     | 423  | 407  | 542  | 266  | 767  | 368  | 1668  | 734  | 328  | 215  | 1243 | 228  | 1892  | 308  | 348  | 2132 |
| 9. Chattanooga, TN   | 84   | 425  | 182  | 28   | 406  | 241  | 526   | 365  | 240  | 146  | 514  | 87   | 2234  | 250  | 118  | 39   |
| 10. Cincinnati, OH   | 217  | 644  | 357  | 168  | 793  | 350  | 1162  | 1125 | 147  | 406  | 551  | 218  | 2621  | 216  | 249  | 2553 |
| 11. Columbia, SC     | 10   | 318  | 9    | 182  | 612  | 446  | 773   | 379  | 150  | 217  | 698  | 59   | 997   | 225  | 363  | 748  |
| 12. Columbus, GA     | 241  | 190  | 127  | 74   | 288  | 209  | 296   | 169  | 92   | 70   | 302  | 55   | 410   | 88   | 11   | 279  |
| 13. Columbus, OH     | 176  | 436  | 317  | 267  | 1728 | 230  | 1091  | 484  | 86   | 219  | 1280 | 263  | 117   | 202  | 229  | 691  |
| 14. Dayton, OH       | 123  | 164  | 95   | 239  | 295  | 231  | 677   | 293  | 21   | 234  | 281  | 215  | 804   | 148  | 329  | 505  |
| 15. Daytona Bch., FL | 45   | 208  | 157  | 60   | 639  | 39   | 107   | 197  | 171  | 759  | 570  | 0    | 197   | 50   | 45   | 469  |
| 16. Evansville, IN   | 1    | 92   | 26   | 18   | 3343 | 79   | 137   | 53   | 55   | 134  | 715  | 40   | 514   | 50   | 36   | 6    |
| 17. Fayetteville, NC |      | 24   | 81   | 449  | 266  | 142  | 112   | 52   | 105  | 104  | 339  | 27   | 409   | 133  | 118  | 253  |
| 18. Greensboro, NC   |      |      | 264  | 649  | 435  | 191  | 835   | 284  | 189  | 165  | 922  | 203  | 1293  | 219  | 231  | 1587 |
| 19. Greenville, SC   |      |      |      | 190  | 279  | 154  | 591   | 135  | 133  | 93   | 300  | 102  | 545   | 208  | 154  | 380  |
| 20. Huntsville, AL   |      |      |      |      | 148  | 298  | 231   | 146  | 78   | 122  | 83   | 94   | 694   | 380  | 54   | 58   |
| 21. Indianapolis, IN |      |      |      |      |      | 456  | 1016  | 182  | 303  | 640  | 971  | 408  | 2365  | 222  | 279  | 705  |
| 22. Jackson, MS      |      |      |      |      |      |      | 472   | 297  | 138  | 414  | 428  | 39   | 2877  | 383  | 438  | 873  |
| 23. Jacksonville, FL |      |      |      |      |      |      |       | 683  | 336  | 245  | 1418 | 94   | 1921  | 658  | 391  | 1094 |
| 24. Knoxville, TN    |      |      |      |      |      |      |       |      | 181  | 236  | 887  | 76   | 3745  | 217  | 165  | 2195 |
| 25. Lexington, KY    |      |      |      |      |      |      |       |      |      | 47   | 215  | 66   | 222   | 72   | 138  | 91   |
| 26. Little Rock, AR  |      |      |      |      |      |      |       |      |      |      | 525  | 23   | 2232  | 179  | 177  | 1107 |
| 27. Louisville, KY   |      |      |      |      |      |      |       |      |      |      |      | 201  | 2712  | 425  | 260  | 682  |
| 28. Melbourne, FL    |      |      |      |      |      |      |       |      |      |      |      |      | 124   | 50   | 43   | 176  |
| 29. Memphis, TN      |      |      |      |      |      |      |       |      |      |      |      |      |       | 1224 | 820  | 6788 |
| 30. Mobile, AL       |      |      |      |      |      |      |       |      |      |      |      |      |       |      | 25   | 787  |
| 31. Montgomery, AL   |      |      |      |      |      |      |       |      |      |      |      |      |       |      |      | 334  |
| 32. Nashville, TN    |      |      |      |      |      |      |       |      |      |      |      |      |       |      |      |      |
| 33. New Orleans, LA  |      |      |      |      |      |      |       |      |      |      |      |      |       |      |      |      |
| 34. Orlando, FL      |      |      |      |      |      |      |       |      |      |      |      |      |       |      |      |      |
| 35. Pensacola, FL    |      |      |      |      |      |      |       |      |      |      |      |      |       |      |      |      |
| 36. Raleigh, NC      |      |      |      |      |      |      |       |      |      |      |      |      |       |      |      |      |
| 37. Richmond, VA     |      |      |      |      |      |      |       |      |      |      |      |      |       |      |      |      |
| 38. Roanoke, VA      |      |      |      |      |      |      |       |      |      |      |      |      |       |      |      |      |
| 39. Sarasota, FL     |      |      |      |      |      |      |       |      |      |      |      |      |       |      |      |      |
| 40. Savannah, GA     |      |      |      |      |      |      |       |      |      |      |      |      |       |      |      |      |
| 41. St. Louis, MO    |      |      |      |      |      |      |       |      |      |      |      |      |       |      |      |      |
| 42. Tallahassee, FL  |      |      |      |      |      |      |       |      |      |      |      |      |       |      |      |      |
| 43. Tampa, FL        |      |      |      |      |      |      |       |      |      |      |      |      |       |      |      |      |

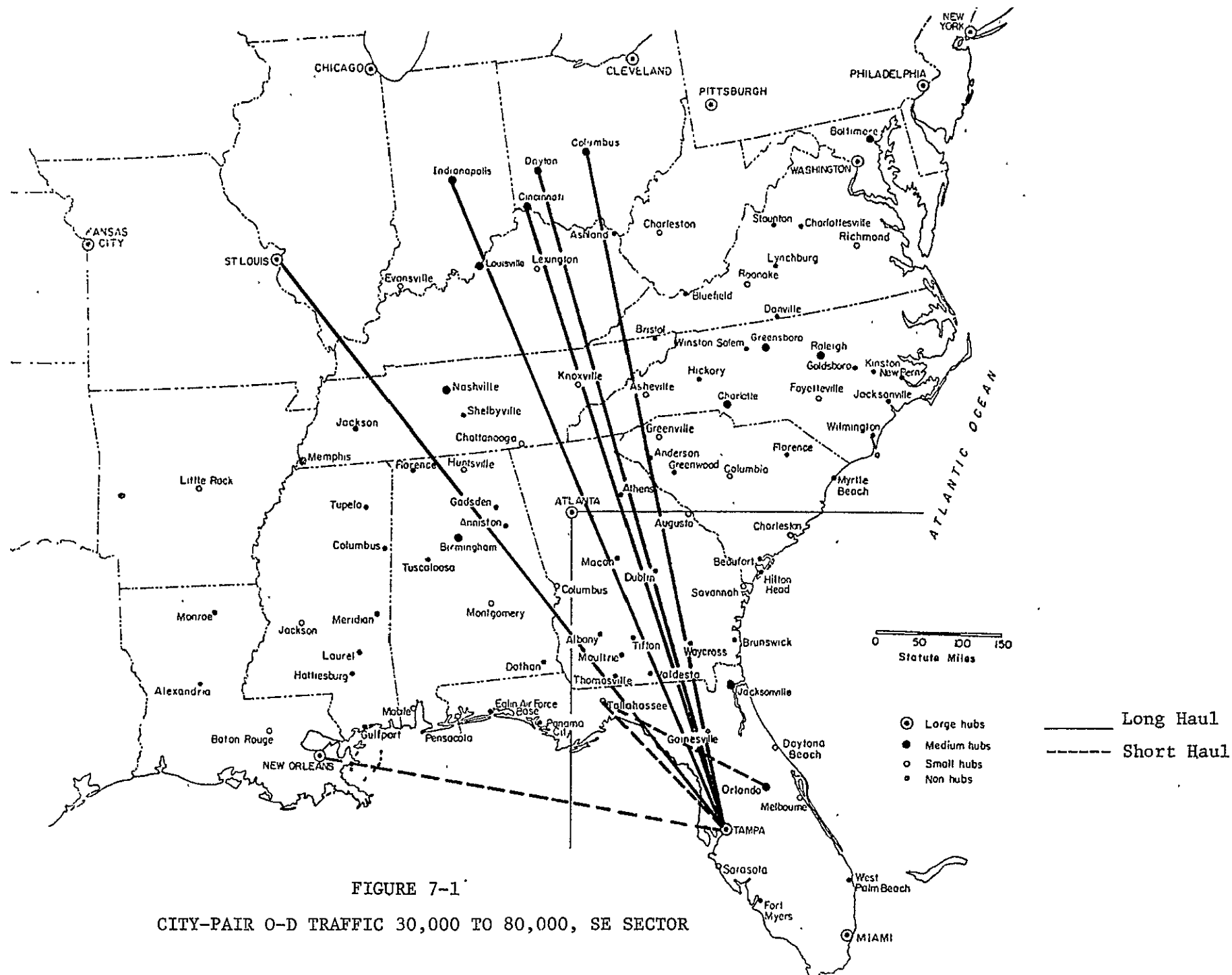
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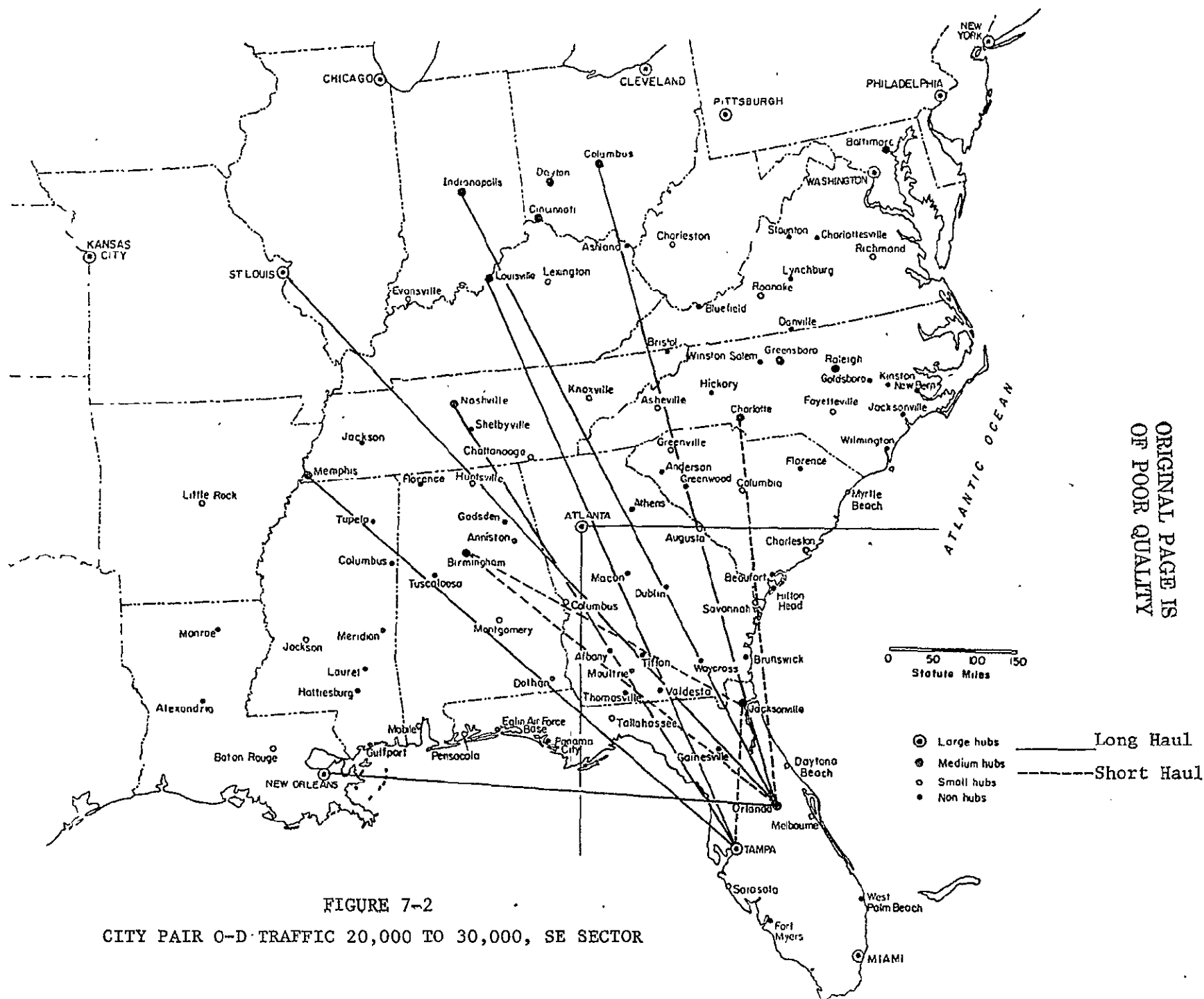


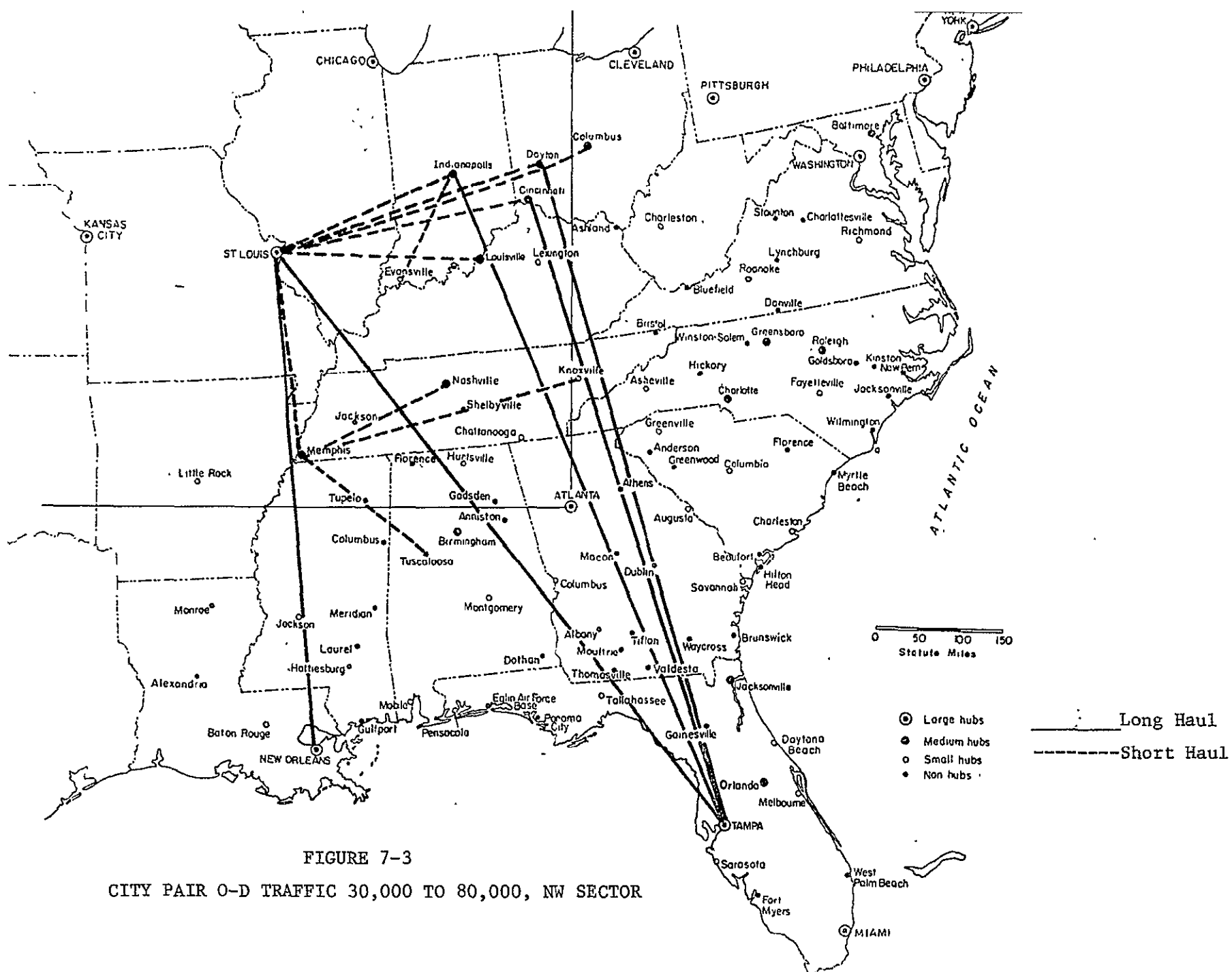
TABLE 7-1 (continued)

| CITY                 | CITY | 33    | 34    | 35   | 36   | 37   | 38   | 39   | 40   | 41   | 42   | 43    | Total<br>for S.H.<br>City Pairs |
|----------------------|------|-------|-------|------|------|------|------|------|------|------|------|-------|---------------------------------|
| 1. Asheville, NC     |      | 362   | 549   | 86   | 1439 | 318  | 267  | 181  | 59   | 193  | 67   | 928   | 9,093                           |
| 2. Atlanta, GA       |      | 12156 | 13915 | 3599 | 9401 | 5942 | 2766 | 2841 | 9275 | 7803 | 3861 | 19427 | 252,437                         |
| 3. Augusta, GA       |      | 405   | 368   | 80   | 193  | 231  | 83   | 55   | 48   | 375  | 38   | 558   | 9,309                           |
| 4. Baton Rouge, LA   |      | 435   | 188   | 26   | 85   | 94   | 42   | 17   | 67   | 380  | 27   | 252   | 4,935                           |
| 5. Birmingham, AL    |      | 3788  | 2695  | 1242 | 748  | 488  | 213  | 138  | 574  | 1553 | 331  | 1799  | 45,362                          |
| 6. Charleston, SC    |      | 840   | 572   | 256  | 337  | 369  | 192  | 51   | 58   | 650  | 100  | 636   | 14,933                          |
| 7. Charleston, WV    |      | 511   | 553   | 82   | 154  | 777  | 404  | 156  | 62   | 319  | 74   | 974   | 6,949                           |
| 8. Charlotte, NC     |      | 1396  | 1939  | 262  | 2389 | 1901 | 589  | 243  | 22   | 1325 | 299  | 2199  | 37,373                          |
| 9. Chattanooga, TN   |      | 713   | 644   | 89   | 475  | 227  | 132  | 96   | 168  | 621  | 86   | 1003  | 14,813                          |
| 10. Cincinnati, OH   |      | 1904  | 2312  | 203  | 833  | 852  | 721  | 441  | 430  | 5378 | 207  | 6355  | 15,030                          |
| 11. Columbia, SC     |      | 872   | 817   | 166  | 351  | 659  | 36   | 90   | 9    | 662  | 153  | 1126  | 19,158                          |
| 12. Columbus, GA     |      | 393   | 359   | 25   | 176  | 178  | 59   | 67   | 242  | 225  | 37   | 502   | 8,134                           |
| 13. Columbus, OH     |      | 1340  | 2295  | 180  | 768  | 521  | 405  | 630  | 397  | 3672 | 156  | 5110  | 20,737                          |
| 14. Dayton, OH       |      | 952   | 1804  | 121  | 255  | 242  | 155  | 384  | 302  | 3481 | 143  | 4515  | 13,422                          |
| 15. Daytona Bch., FL |      | 160   | 15    | 91   | 205  | 207  | 82   | 23   | 8    | 663  | 21   | 251   | 5,820                           |
| 16. Evansville, IN   |      | 428   | 310   | 65   | 134  | 109  | 83   | 156  | 33   | 1157 | 34   | 584   | 8,611                           |
| 17. Fayetteville, NC |      | 263   | 173   | 43   | 0    | 46   | 78   | 38   | 25   | 277  | 77   | 384   | 5,961                           |
| 18. Greensboro, NC   |      | 851   | 1017  | 173  | 127  | 681  | 192  | 294  | 162  | 756  | 188  | 1213  | 18,205                          |
| 19. Greenville, SC   |      | 502   | 534   | 267  | 597  | 439  | 204  | 167  | 65   | 518  | 132  | 856   | 11,627                          |
| 20. Huntsville, AL   |      | 996   | 1509  | 81   | 376  | 178  | 55   | 78   | 100  | 1267 | 43   | 483   | 11,979                          |
| 21. Indianapolis, IN |      | 2090  | 2988  | 307  | 694  | 361  | 296  | 1253 | 396  | 5243 | 199  | 5612  | 27,371                          |
| 22. Jackson, MS      |      | 1751  | 622   | 13   | 273  | 161  | 100  | 51   | 148  | 1360 | 121  | 610   | 18,340                          |
| 23. Jacksonville, FL |      | 1921  | 661   | 1131 | 818  | 623  | 308  | 424  | 176  | 1372 | 694  | 2903  | 33,310                          |
| 24. Knoxville, TN    |      | 887   | 1063  | 121  | 530  | 302  | 185  | 172  | 244  | 746  | 121  | 1280  | 23,252                          |
| 25. Lexington, KY    |      | 574   | 675   | 65   | 470  | 455  | 331  | 89   | 110  | 414  | 82   | 770   | 8,147                           |
| 26. Little Rock, AR  |      | 1880  | 398   | 42   | 213  | 154  | 54   | 33   | 97   | 3888 | 34   | 441   | 14,859                          |
| 27. Louisville, KY   |      | 1524  | 1615  | 277  | 905  | 1828 | 633  | 328  | 331  | 4526 | 219  | 2741  | 32,403                          |
| 28. Melbourne, FL    |      | 291   | 20    | 98   | 208  | 142  | 54   | 9    | 9    | 384  | 47   | 280   | 3,040                           |
| 29. Memphis, TN      |      | 7057  | 3041  | 314  | 1067 | 530  | 457  | 246  | 462  | 7253 | 461  | 2259  | 64,066                          |
| 30. Mobile, AL       |      | 1934  | 844   | 23   | 191  | 239  | 57   | 73   | 211  | 676  | 145  | 1016  | 16,532                          |
| 31. Montgomery, AL   |      | 883   | 400   | 11   | 268  | 168  | 83   | 40   | 210  | 482  | 105  | 553   | 11,045                          |
| 32. Nashville, TN    |      | 2334  | 1834  | 380  | 1314 | 995  | 533  | 371  | 316  | 2987 | 381  | 2174  | 44,967                          |
| 33. New Orleans, LA  |      |       | 2447  | 638  | 1008 | 805  | 344  | 278  | 632  | 5807 | 471  | 4702  | 40,409                          |
| 34. Orlando, FL      |      |       |       | 708  | 1131 | 839  | 379  | 151  | 248  | 2813 | 4050 | 1090  | 30,108                          |
| 35. Pensacola, FL    |      |       |       |      | 244  | 115  | 72   | 110  | 125  | 640  | 182  | 1505  | 11,671                          |
| 36. Raleigh, NC      |      |       |       |      |      | 567  | 113  | 199  | 195  | 1358 | 312  | 1372  | 24,742                          |
| 37. Richmond, VA     |      |       |       |      |      |      | 2314 | 170  | 217  | 790  | 207  | 1077  | 18,888                          |
| 38. Roanoke, VA      |      |       |       |      |      |      |      | 114  | 86   | 466  | 77   | 536   | 11,533                          |
| 39. Sarasota, FL     |      |       |       |      |      |      |      |      | 31   | 750  | 164  | 677   | 5,191                           |
| 40. Savannah, GA     |      |       |       |      |      |      |      |      |      | 400  | 50   | 411   | 13,838                          |
| 41. St. Louis, MO    |      |       |       |      |      |      |      |      |      |      | 423  | 5413  | 52,343                          |
| 42. Tallahassee, FL  |      |       |       |      |      |      |      |      |      |      |      | 4423  | 17,187                          |
| 43. Tampa, FL        |      |       |       |      |      |      |      |      |      |      |      |       | 42,715                          |

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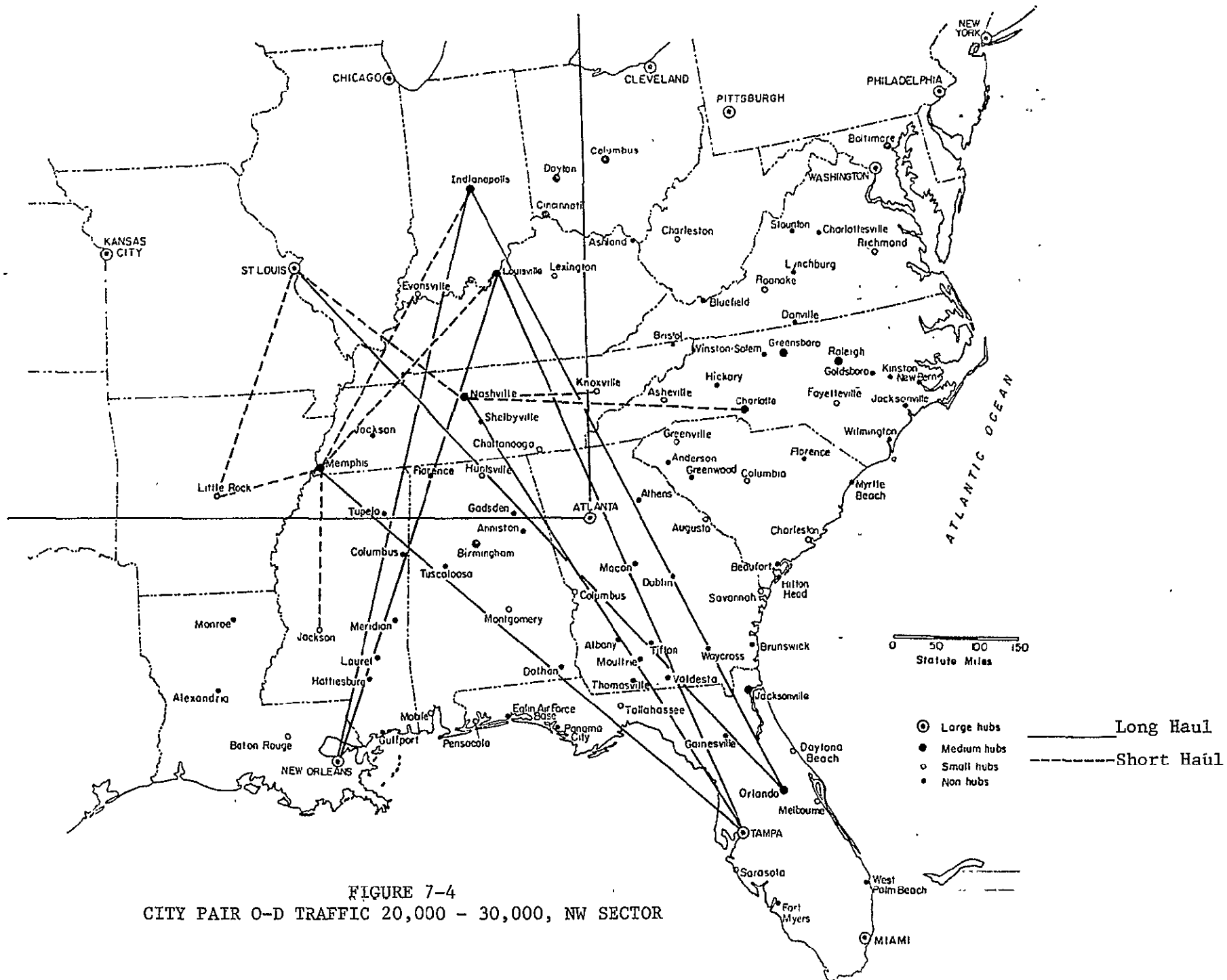


FIGURE 7-4  
CITY PAIR O-D TRAFFIC 20,000 - 30,000, NW SECTOR

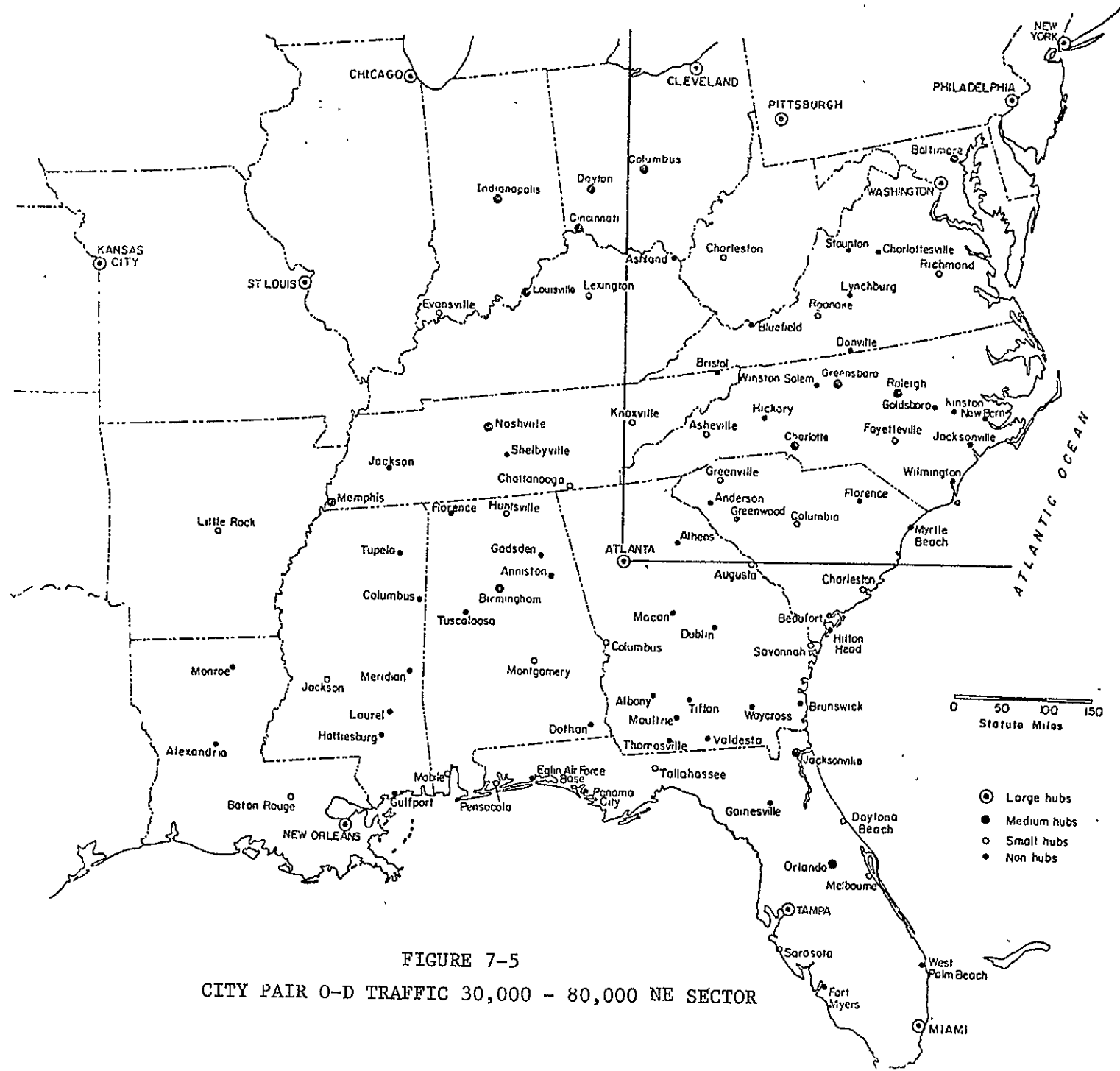
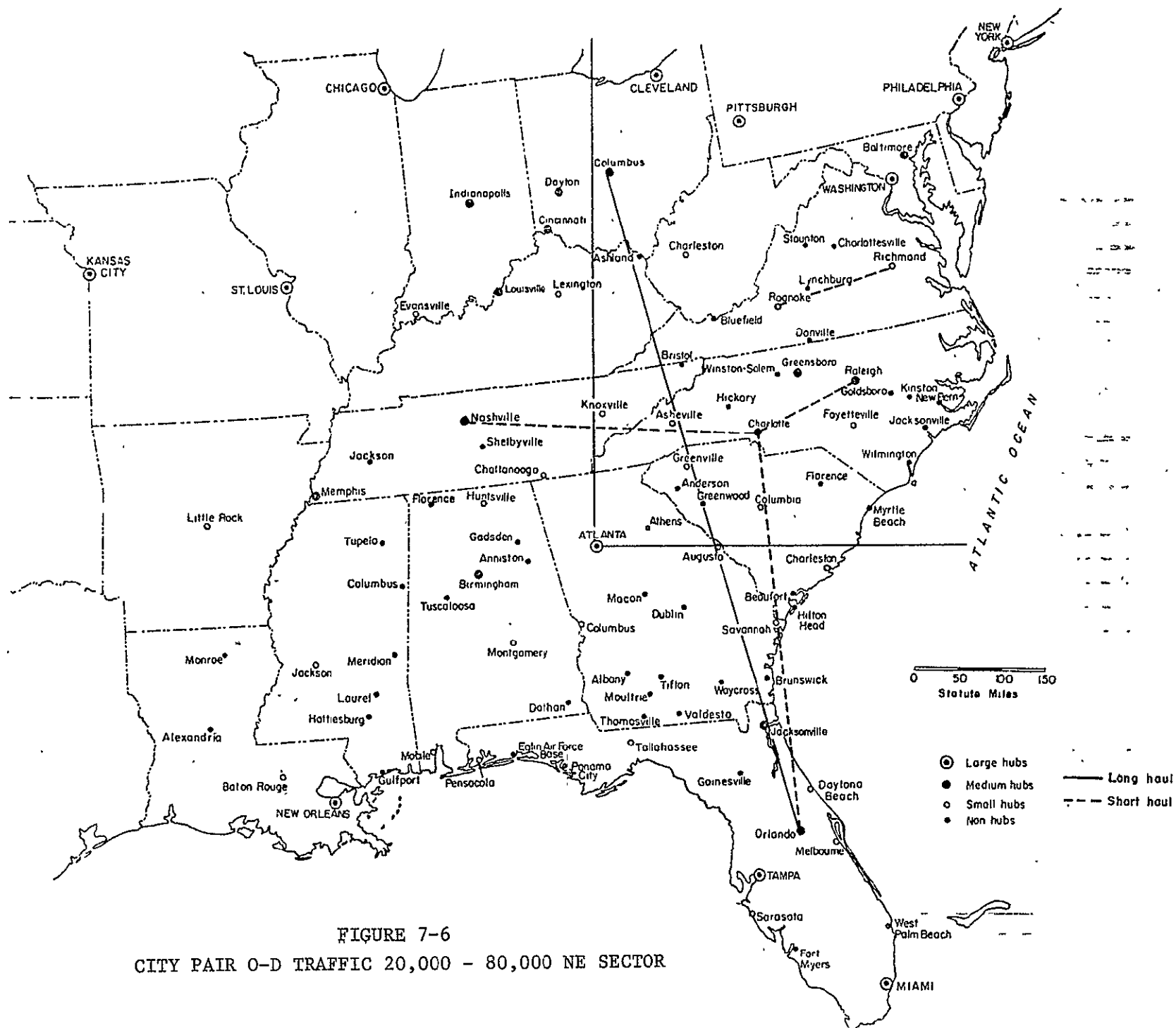


FIGURE 7-5  
CITY PAIR O-D TRAFFIC 30,000 - 80,000 NE SECTOR



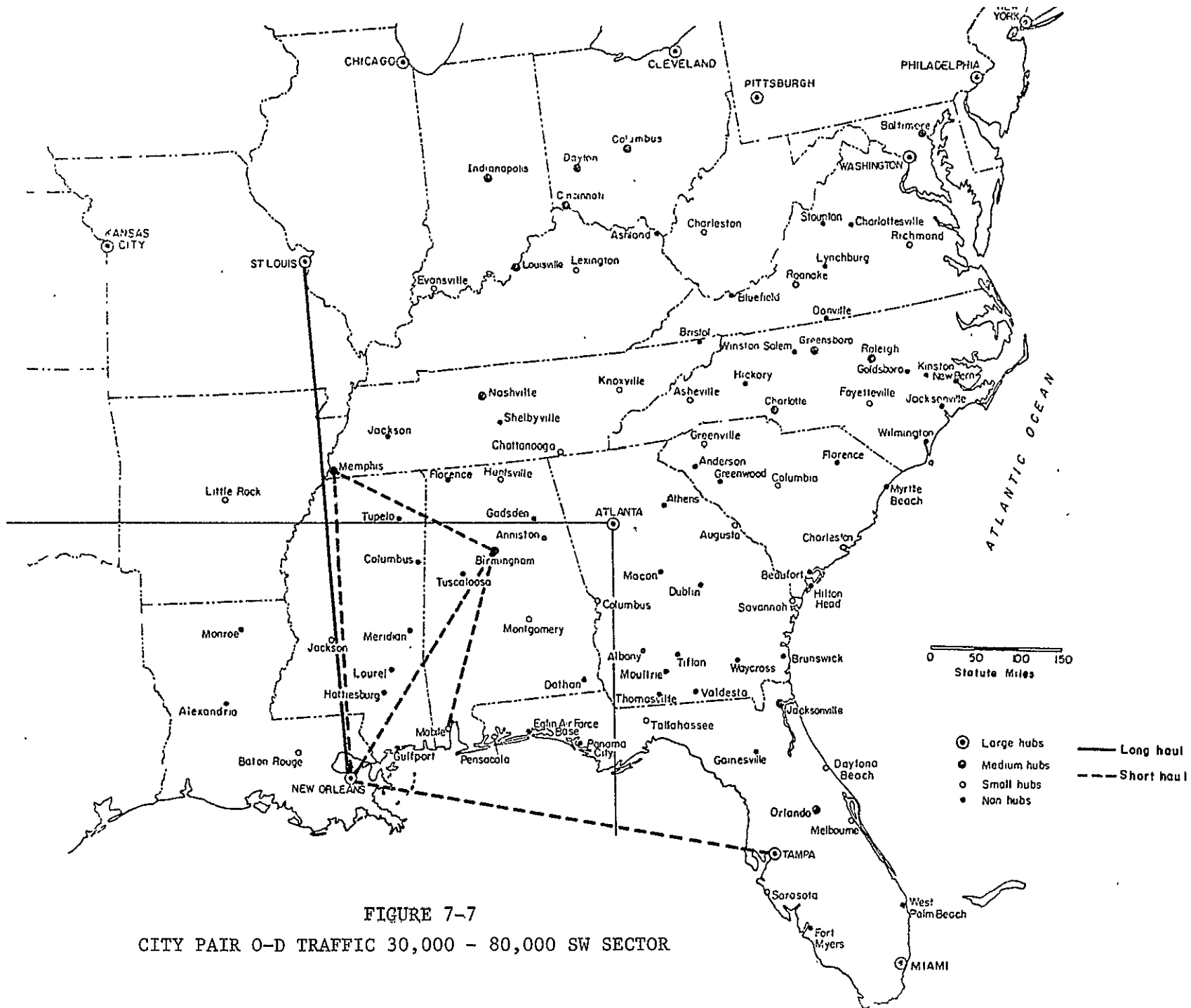


FIGURE 7-7  
CITY PAIR O-D TRAFFIC 30,000 - 80,000 SW SECTOR



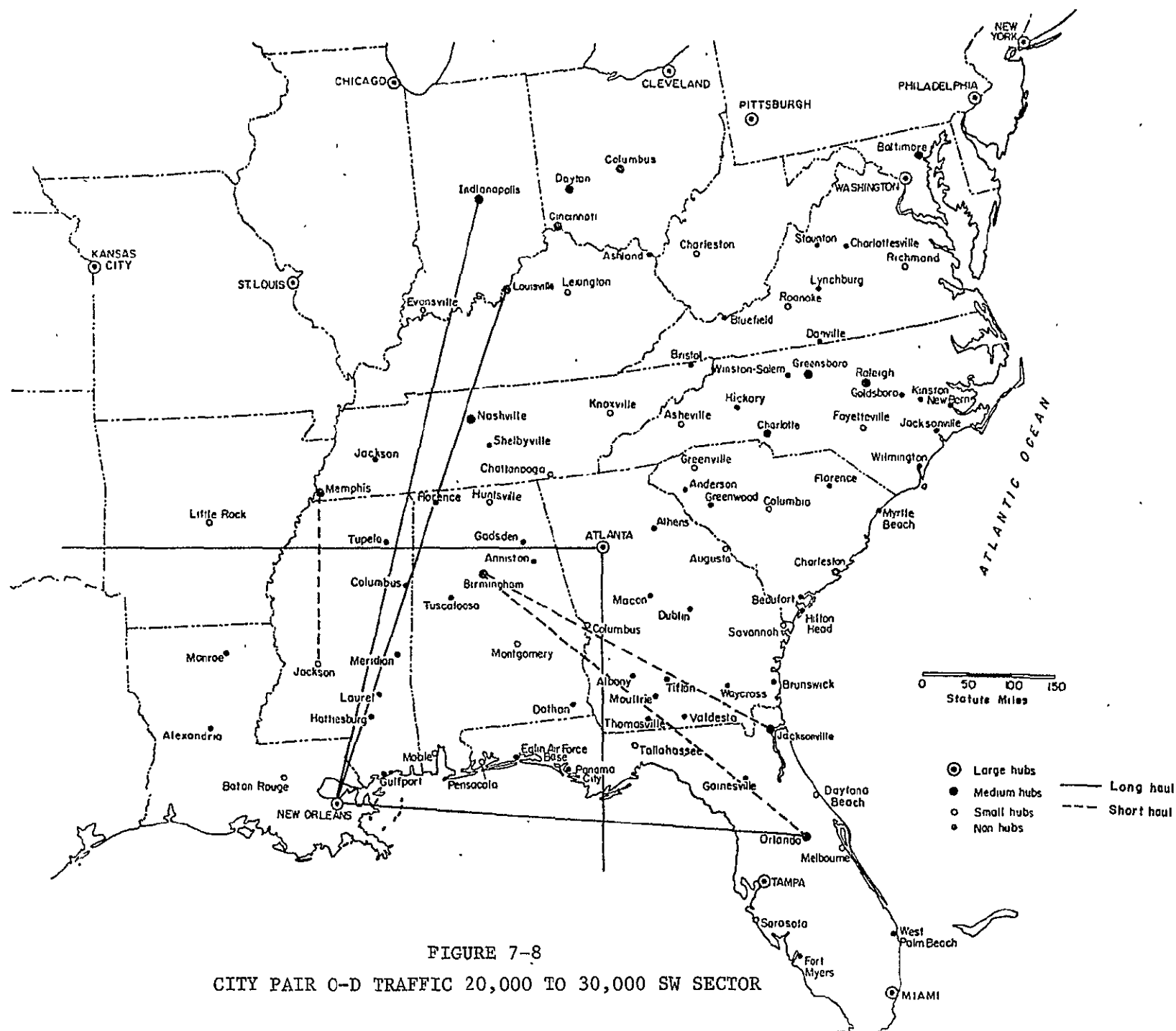


FIGURE 7-8

CITY PAIR O-D TRAFFIC 20,000 TO 30,000 SW SECTOR

The most striking tendency exhibited by the origin destination patterns appears to be that all high volume patterns are in the Southeast-Northwest direction, as shown on Figures 7-1 -- 7-4. In fact, Figures 7-5 and 7-6 indicate that there are virtually no origin destination demands between the cities in the Northeastern sector of the region and the other cities. These cities may interact locally with hubs outside the study region, such as Washington and Pittsburgh.

The patterns of high origin destination demand in the southeast-Northwest direction encourage the role of Atlanta as a major transfer hub. To this can be added major flows between the cities in the region and Miami and Chicago outside it as shown in Figures 7-9 through 7-12. On the other hand, in the Southwest-Northeast direction it can be seen from Figure 7-13 through 7-15 that the major flows between the cities region and the major hubs outside do not generate traffic flow across the region but flows that are concentrated to the North and East.

#### Service Patterns

Extensive data analysis of service patterns in the study region has been undertaken. These patterns are summarized on the basis of weekly service frequencies, and stratified by hub size. The data summaries are shown in Tables 7-2 through 7-10 and Figures 7-16 through 7-25. In general, the network serving the region exhibits rather high connectivity with many direct connection between cities including small hubs and non-hubs. However, interesting patterns do appear and require further analysis. For example, it is seen that the small hubs in the Northeastern sector are not very highly connected with the large hubs of the study region. Furthermore, the networks

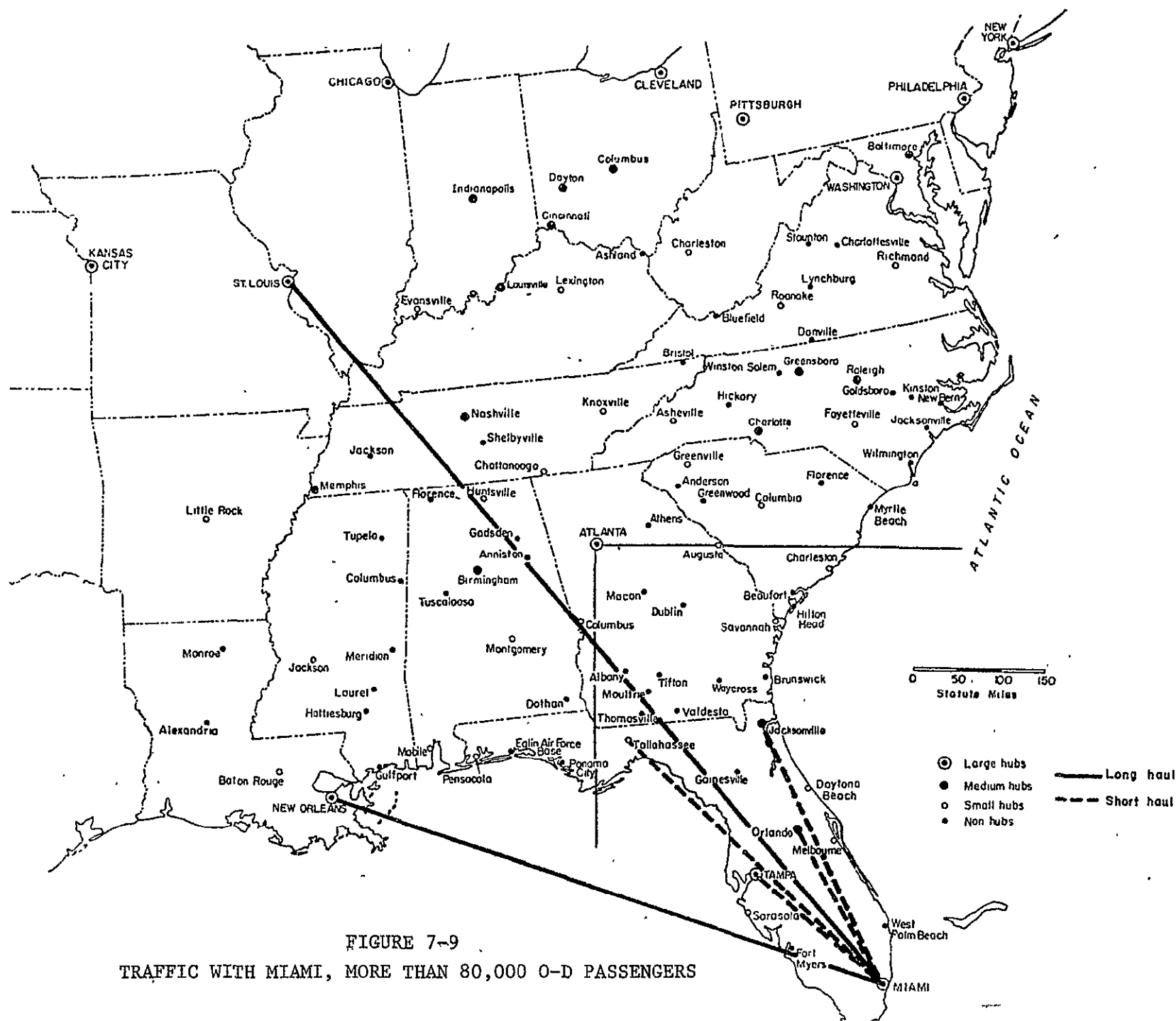


FIGURE 7-9  
TRAFFIC WITH MIAMI, MORE THAN 80,000 O-D PASSENGERS





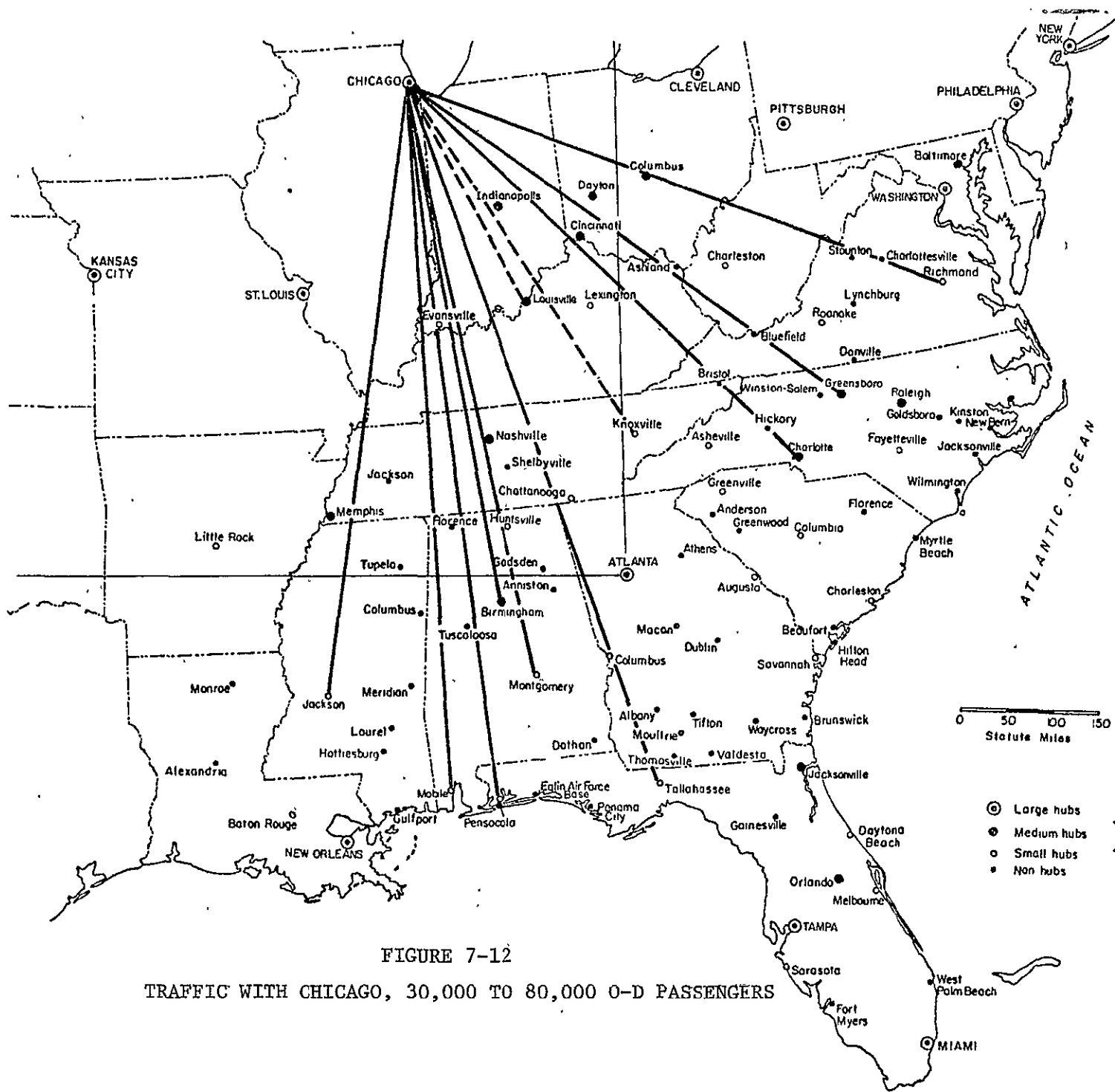


FIGURE 7-12  
TRAFFIC WITH CHICAGO, 30,000 TO 80,000 O-D PASSENGERS

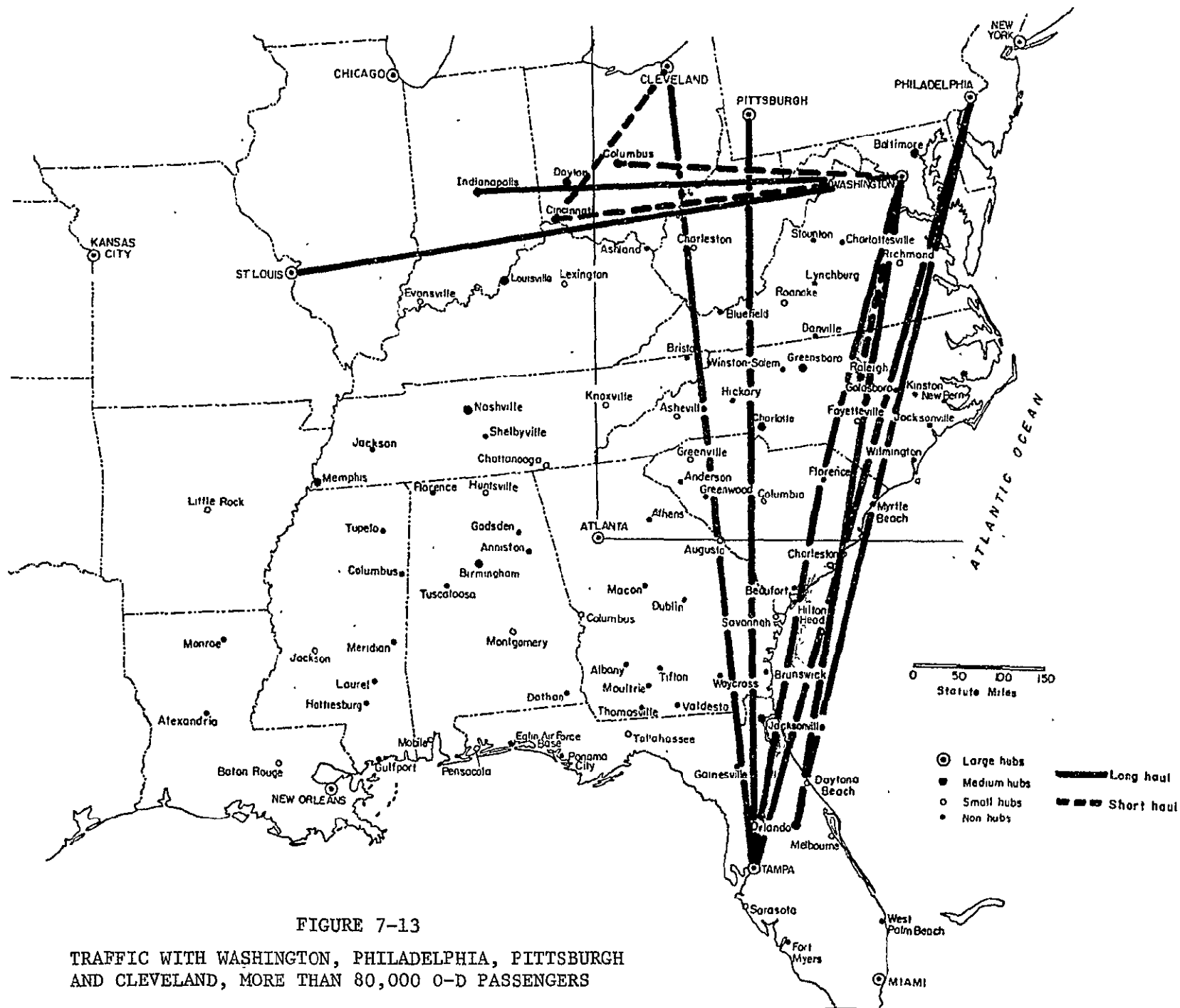


FIGURE 7-13

TRAFFIC WITH WASHINGTON, PHILADELPHIA, PITTSBURGH  
AND CLEVELAND, MORE THAN 80,000 O-D PASSENGERS

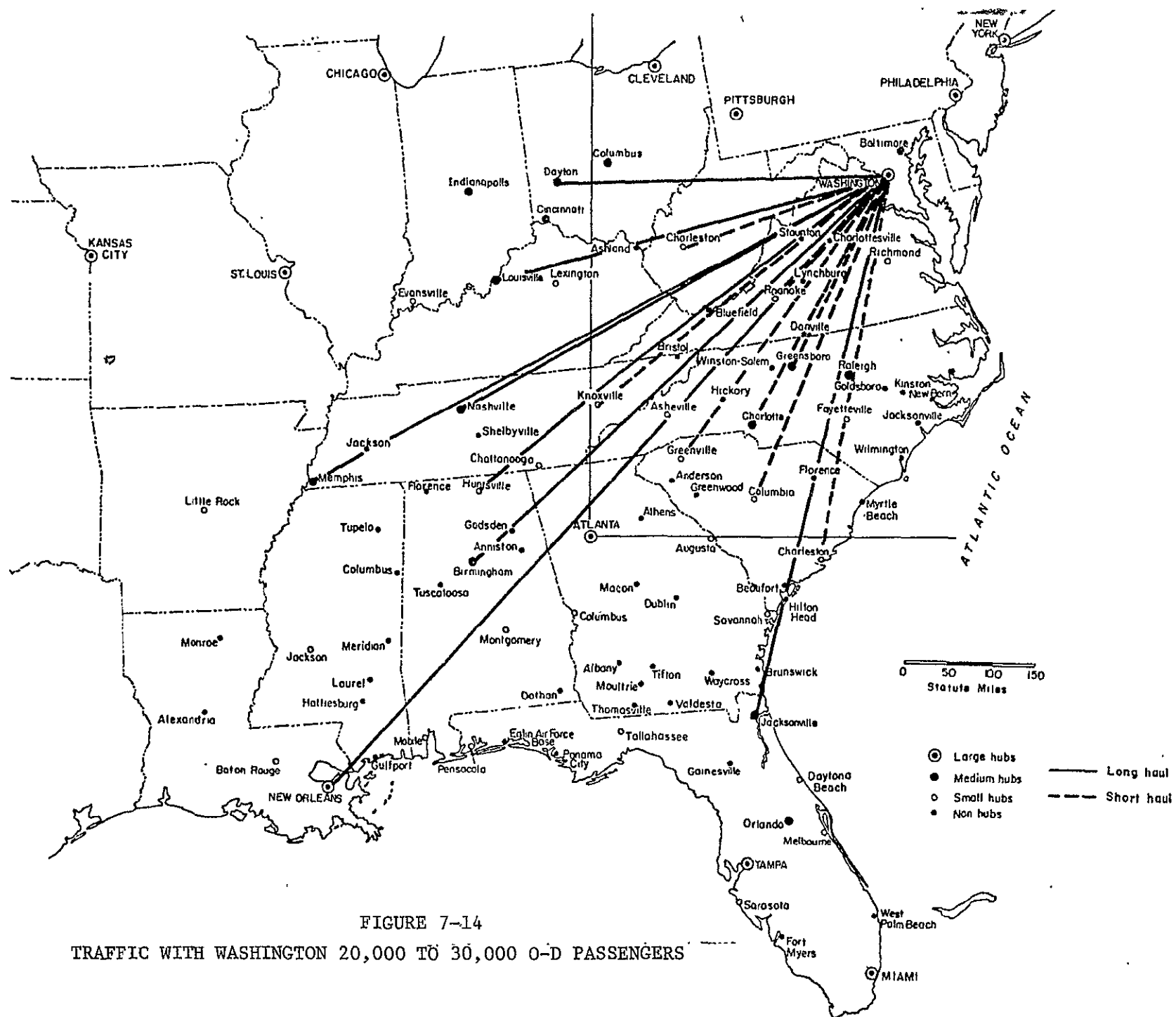


FIGURE 7-14  
TRAFFIC WITH WASHINGTON 20,000 TO 30,000 O-D PASSENGERS



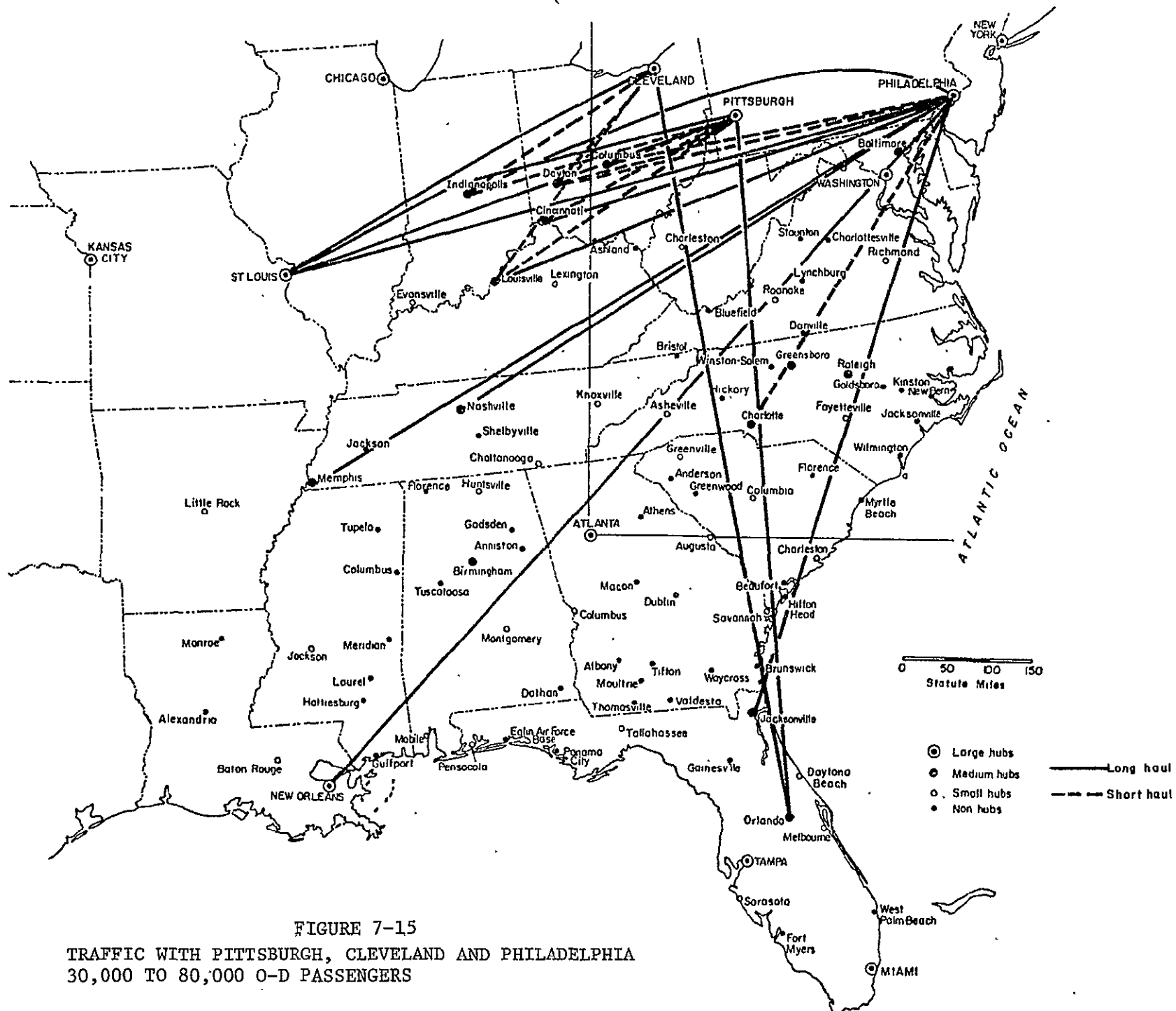


FIGURE 7-15

TRAFFIC WITH PITTSBURGH, CLEVELAND AND PHILADELPHIA  
30,000 TO 80,000 O-D PASSENGERS

TABLE 7-2

DIRECT FLIGHTS BETWEEN LARGE AND LARGE HUBS  
AND BETWEEN LARGE AND MEDIUM HUBS<sup>(1)</sup>

| City-Pair        |                  | Total<br># of<br>Flights | Estimated<br># of<br>passenger<br>seats | Non-stop<br>flights<br>% of<br>total |
|------------------|------------------|--------------------------|-----------------------------------------|--------------------------------------|
| Large-Large      |                  |                          |                                         |                                      |
| HIGH FREQUENCY   |                  |                          |                                         |                                      |
| St. Louis, MO    | New Orleans, LA  | 119                      | 8162                                    |                                      |
| MEDIUM FREQUENCY |                  |                          |                                         |                                      |
| St. Louis, MO    | Tampa, FL        | 63                       | 10269                                   |                                      |
| New Orleans, LA  | Tampa, FL        | 77                       | 12971                                   |                                      |
| Large-Medium     |                  |                          |                                         |                                      |
| HIGH FREQUENCY   |                  |                          |                                         |                                      |
| New Orleans, LA  | Memphis, TN      | 195                      | 12418                                   | 50                                   |
| St. Louis, MO    | Memphis, TN      | 181                      | 9164                                    | 84*                                  |
| St. Louis, MO    | Indianapolis, IN | 147                      | 15902                                   | 100                                  |
| Tampa, FL        | Orlando, FL      | 175                      | 20944                                   | 100                                  |
| Tampa, FL        | Jacksonville, FL | 112                      | 10808                                   |                                      |

(1) See footnote on Table 4-3

\*6% flights with stops are Commuter Air Carrier

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TABLE 7-3

## DIRECT FLIGHTS BETWEEN MEDIUM HUBS

| City-Pair        |                  | Total<br># of<br>flights | Estimated<br>passenger |
|------------------|------------------|--------------------------|------------------------|
| Medium-Medium    |                  |                          |                        |
| High Frequency   |                  |                          |                        |
| Columbus, OH     | Dayton, OH       | 192                      | 23897                  |
| Indianapolis, IN | Louisville, KY   | 144                      | 12943                  |
| Indianapolis, IN | Raleigh, NC      | 146                      | 13276                  |
| Memphis, TN      | Nashville, TN    | 197                      | 20103                  |
| Medium Frequency |                  |                          |                        |
| Birmingham, AL   | Memphis, TN      | 84                       | 6202                   |
| Birmingham, AL   | Nashville, TN    | 49                       | 2744                   |
| Birmingham, AL   | Orlando, FL      | 42                       | 2352                   |
| Charlotte, NC    | Columbus, OH     | 42                       | 3157                   |
| Charlotte, NC    | Memphis, TN      | 62                       | 8343                   |
| Charlotte, NC    | Raleigh, NC      | 82                       | 8588                   |
| Charlotte, NC    | Greensboro, NC   | 72                       | 5798                   |
| Cincinnati, OH   | Columbus, OH     | 63                       | 8148                   |
| Cincinnati, OH   | Dayton, OH       | 102                      | 7739                   |
| Cincinnati, OH   | Greensboro, NC   | 42                       | 1995                   |
| Cincinnati, OH   | Indianapolis, IN | 90                       | 8785                   |
| Cincinnati, OH   | Louisville, KY   | 70                       | 3724                   |
| Columbus, OH     | Indianapolis, IN | 45                       | 5346                   |
| Dayton, OH       | Indianapolis, IN | 91                       | 7973                   |

TABLE 7-3 (continued)

| City-Pair        |                  | Total<br># of<br>flights | Estimated<br># of<br>passenger<br>seats |
|------------------|------------------|--------------------------|-----------------------------------------|
| Greensboro, NC   | Raleigh, NC      | 42                       | 2674                                    |
| Indianapolis, IN | Memphis, TN      | 70                       | 5418                                    |
| Jacksonville, FL | Memphis, TN      | 49                       | 5642                                    |
| Jacksonville, FL | Orlando, FL      | 56                       | 7987                                    |
| Louisville, KY   | Nashville, TN    | 42                       | 2534                                    |
| Memphis, TN      | Orlando, FL      | 70                       | 6720                                    |
| Low Frequency    |                  |                          |                                         |
| Birmingham, AL   | Charlotte, NC    | 21                       | 2674                                    |
| Birmingham, AL   | Cincinnati, OH   | 14                       | 784                                     |
| Birmingham, AL ← | Columbus, OH     | 7                        | 392                                     |
| Birmingham, AL   | Greensboro, NC   | 14                       | 784                                     |
| Birmingham, AL → | Indianapolis, IN | 7                        | 392                                     |
| Birmingham, AL   | Jacksonville, FL | 28                       | 1568                                    |
| Birmingham, AL   | Raleigh, NC      | 21                       | 3122                                    |
| Charlotte, NC    | Cincinnati, OH   | 35                       | 1785                                    |
| Charlotte, NC    | Louisville, KY   | 28                       | 1365                                    |
| Charlotte, NC    | Nashville, TN    | 34                       | 4080                                    |
| Charlotte, NC    | Orlando, FL      | 21                       | 2576                                    |
| Cincinnati, OH   | Memphis, TN      | 21                       | 3311                                    |
| Cincinnati, OH   | Nashville, TN    | 41                       | 6972                                    |
| Cincinnati, OH   | Orlando, FL      | 21                       | 3325                                    |
| Cincinnati, OH   | Raleigh, NC      | 28                       | 1575                                    |

TABLE 7-3 (continued)

| City-Pair        |                  | Total<br># of<br>flights | Estimated<br># of<br>passenger<br>seats |
|------------------|------------------|--------------------------|-----------------------------------------|
| Columbus, OH     | Greensboro, NC   | 14                       | 840                                     |
| Columbus, OH     | Louisville, KY   | 21                       | 3423                                    |
| Columbus, OH     | Memphis, TN      | 7                        | 1141                                    |
| Dayton, OH       | Jacksonville, FL | 7                        | 700                                     |
| Dayton, OH       | Louisville, KY   | 14                       | 2282                                    |
| Dayton, OH       | Nashville, TN    | 7                        | 1141                                    |
| Dayton, OH       | Orlando, FL      | 7                        | 1141                                    |
| Dayton, OH       | Raleigh, NC      | 7                        | 1141                                    |
| Greensboro, NC   | Louisville, KY   | 28                       | 1365                                    |
| Greensboro, NC   | Memphis, TN      | 34                       | 4080                                    |
| Greensboro, NC   | Nashville, TN    | 34                       | 5542                                    |
| Indianapolis, IN | Jacksonville, FL | 14                       | 1304                                    |
| Indianapolis, IN | Orlando, FL      | 21                       | 1176                                    |
| Jacksonville, FL | Louisville, KY   | 14                       | 2282                                    |
| Louisville, KY   | Memphis, TN      | 21                       | 3423                                    |
| Louisville, KY   | Raleigh, NC      | 21                       | 1155                                    |
| Memphis, TN      | Raleigh, NC      | 14                       | 1680                                    |
| Nashville, TN    | Orlando, FL      | 21                       | 1176                                    |
| Nashville, TN    | Raleigh, NC      | 21                       | 2520                                    |

TABLE 7-4

## DIRECT FLIGHTS BETWEEN LARGE AND SMALL CITIES

| City-pair        |                 | Total<br># of<br>Flights | Estimated #<br>of Passenger<br>Seats |
|------------------|-----------------|--------------------------|--------------------------------------|
| High Frequency   |                 |                          |                                      |
| Large Hub        | Small Hub       |                          |                                      |
| New Orleans, LA+ | Baton Rouge, LA | 188                      | ++                                   |
| Tampa, FL+       | Sarasota, FL    | 209                      | 16285                                |
| New Orleans, LA  | Mobile, AL      | 111                      | 11907                                |

(1) See footnote on Table 4-3

+ Commuter Carrier

+ + Aircraft Type Varies

TABLE 7-5

## DIRECT FLIGHTS BETWEEN MEDIUM HUBS AND SMALL HUBS

| City-Pair      |                    | Total<br># of<br>flights | Estimated<br># of pass-<br>enger seats |
|----------------|--------------------|--------------------------|----------------------------------------|
| Medium Hub     | Small Hub          |                          |                                        |
| Birmingham, AL | → Asheville, NC    | 6                        | 720                                    |
|                | ← Columbia, SC     | 7                        | 1141                                   |
|                | → Greenville, SC   | 7                        | 840                                    |
|                | * Jackson, MS      | 63                       | 5775                                   |
|                | * Mobile, FL       | 56                       | 3136                                   |
|                | Montgomery, AL     | 28                       | 1568                                   |
|                | * Pensacola, FL    | 42                       | 3101                                   |
|                | Savannah, GA       | 14                       | 784                                    |
|                | Tallahassee, FL    | 14                       | 784                                    |
| Charlotte, NC  | Asheville, NC      | 28                       | 1470                                   |
|                | * Augusta, GA      | 42                       | 3101                                   |
|                | ← Baton Rouge, LA  | 7                        | 392                                    |
|                | * Charleston, SC   | 56                       | 4480                                   |
|                | Charleston, WV     | 14                       | 630                                    |
|                | * Chattanooga, TN  | 42                       | 2352                                   |
|                | * Columbia, SC     | 56                       | 4480                                   |
|                | * Fayetteville, NC | 42                       | 3752                                   |
|                | * Greenville, SC   | 84                       | 7091                                   |
|                | Knoxville, TN      | 33                       | 1485                                   |
|                | → Lexington, KY    | 7                        | 315                                    |
|                | Richmond, VA       | 41                       | 4560                                   |
|                | Roanoke, VA        | 28                       | 1414                                   |
| Cincinnati, OH | ← Asheville, NC    | 7                        | 315                                    |
|                | Augusta, GA        | 21                       | 1176                                   |
|                | Charleston, SC     | 14                       | 630                                    |
|                | * Charleston, WV   | 83                       | 10325                                  |
|                | * Chattanooga, TN  | 42                       | 2352                                   |
|                | Columbia, SC       | 28                       | 1414                                   |
|                | Fayetteville, NC   | 21                       | 1155                                   |
|                | Greenville, SC     | 14                       | 630                                    |
|                | * Knoxville, TN    | 49                       | 3493                                   |
|                | * Lexington, KY    | 56                       | 3682                                   |
|                | → Montgomery, AL   | 7                        | 392                                    |
|                | Richmond, VA       | 35                       | 1890                                   |
|                | * Roanoke, VA      | 77                       | 4410                                   |
|                | Savannah, GA       | 21                       | 1176                                   |

TABLE 7-5 (continued)

| City-Pair          |                  | Total<br># of<br>flights | Estimated<br># of pass-<br>enger seats |
|--------------------|------------------|--------------------------|----------------------------------------|
| Medium Hub         | Small Hub        |                          |                                        |
| Columbus, OH ←     | Charleston, WV   | 14                       | 840                                    |
|                    | Knoxville, TN    | 7                        | 392                                    |
|                    | Roanoke, VA      | 14                       | 840                                    |
| Dayton, OH →       | Charleston, SC   | 14                       | 784                                    |
|                    | Chattanooga, TN  | 14                       | 784                                    |
|                    | Columbus, GA     | 7                        | 392                                    |
|                    | Knoxville, TN    | 14                       | 784                                    |
| Greensboro, NC ←   | Asheville, NC    | 7                        | 840                                    |
|                    | Charleston, SC   | 14                       | 730                                    |
|                    | Charleston, WV   | 35                       | 1890                                   |
|                    | Columbia, SC     | 14                       | 630                                    |
|                    | Greenville, SC   | 7                        | 420                                    |
|                    | Huntsville, AL   | 21                       | 2821                                   |
|                    | Knoxville, TN    | 7                        | 420                                    |
|                    | Lexington, KY    | 14                       | 490                                    |
|                    | Pensacola, FL    | 7                        | 392                                    |
| Indianapolis, IN ← | Roanoke, VA      | 42                       | 2824                                   |
|                    | Augusta, GA      | 7                        | 392                                    |
|                    | Charleston, SC   | 7                        | 392                                    |
|                    | Columbus, GA     | 7                        | 392                                    |
|                    | Evansville, IN   | 77                       | 4312                                   |
|                    | Lexington, KY    | 7                        | 392                                    |
|                    | Montgomery, AL   | 14                       | 784                                    |
| Jacksonville, FL * | Pensacola, FL    | 21                       | 1176                                   |
|                    | Charleston, SC   | 49                       | 7084                                   |
|                    | Columbus, GA     | 7                        | 266                                    |
|                    | Columbia, SC     | 14                       | 392                                    |
|                    | Dayton Beach, FL | 112                      | 12264                                  |
|                    | Melbourne, FL    | 14                       | 2282                                   |
|                    | Mobile, AL       | 28                       | 4564                                   |
|                    | Montgomery, AL   | 7                        | 392                                    |
|                    | Pensacola, FL    | 28                       | 4564                                   |
|                    | Sarasota, FL     | 21                       | 1925                                   |
|                    | Savannah, GA     | 28                       | 4564                                   |
|                    | Tallahassee, FL  | 28                       | 4564                                   |



TABLE 7-5 (continued)

| City-Pair      |                    | Total<br># of<br>flights | Estimated<br># of pass-<br>enger seats |
|----------------|--------------------|--------------------------|----------------------------------------|
| Medium Hub     | Small Hub          |                          |                                        |
| Louisville, KY | Asheville, NC      | 21                       | 1099                                   |
|                | Augusta, GA        | 14                       | 784                                    |
|                | Charleston, SC     | 21                       | 1848                                   |
|                | Charleston, WV     | 21                       | 1995                                   |
|                | Chattanooga, TN    | 31                       | 1556                                   |
|                | Columbia, SC       | 21                       | 1022                                   |
|                | Evansville, IN     | 28                       | 2317                                   |
|                | → Fayetteville, NC | 14                       | 812                                    |
|                | → Greenville, SC   | 7                        | 420                                    |
|                | Knoxville, TN      | 21                       | 1925                                   |
|                | * Lexington, KY    | 42                       | 3017                                   |
|                | ← Montgomery, AL   | 14                       | 784                                    |
|                | Pensacola, FL      | 14                       | 784                                    |
|                | Richmond, VA       | 21                       | 1995                                   |
|                | Roanoke, VA        | 35                       | 2730                                   |
|                | ← Savannah, GA     | 14                       | 1533                                   |
| Memphis, TN    | → Asheville, NC    | 7                        | 840                                    |
|                | ← Augusta, GA      | 7                        | 1141                                   |
|                | * Baton Rouge, LA  | 42                       | 2352                                   |
|                | ← Charleston, SC   | 7                        | 1141                                   |
|                | * Chattanooga, TN  | 42                       | 3850                                   |
|                | ← Columbia, SC     | 7                        | 1141                                   |
|                | Evansville, IN     | 28                       | 1568                                   |
|                | Fayetteville, NC   | 14                       | 1680                                   |
|                | Greenville, SC     | 28                       | 1568                                   |
|                | * Huntsville, AL   | 56                       | 3010                                   |
|                | ** Jackson, MS     | 142                      | 8366                                   |
|                | * Knoxville, TN    | 68                       | 7609                                   |
|                | ** Little Rock, AR | 195                      | 17050                                  |
|                | * Mobile, AL       | 62                       | 3472                                   |
|                | Montgomery, AL     | 28                       | 1568                                   |
|                | ← Richmond, VA     | 14                       | 1680                                   |
|                | → Roanoke, VA      | 7                        | 840                                    |
|                | Tallahassee, FL    | 14                       | 784                                    |
| Nashville, TN  | Asheville, NC      | 14                       | 1680                                   |
|                | + Chattanooga, TN  | 21                       | 168                                    |
|                | → Columbus, GA     | 7                        | 392                                    |
|                | Huntsville, AL     | 21                       | 1176                                   |
|                | * Knoxville, TN    | 56                       | 2877                                   |
|                | * Little Rock, AR  | 49                       | 7987                                   |
|                | * Mobile, AL       | 42                       | 2352                                   |
|                | Richmond, VA       | 35                       | 4200                                   |
|                | Roanoke, VA        | 14                       | 1680                                   |
|                | ← Sarasota, FL     | 7                        | 1141                                   |
|                | → Tallahassee, FL  | 7                        | 1141                                   |

TABLE 7-5 (continued)

| City-Pair   |                   | Total<br># of<br>flights | Estimated<br># of pass-<br>enger seats |
|-------------|-------------------|--------------------------|----------------------------------------|
| Medium Hub  | Small Hub         |                          |                                        |
| Orlando, FL | Charleston, SC    | 14                       | 2282                                   |
|             | Columbia, GA      | 28                       | 1568                                   |
|             | Daytona Bch. FL   | 14                       | 2282                                   |
|             | Huntsville, AL    | 14                       | 2282                                   |
|             | Jackson, MS       | 14                       | 784                                    |
|             | Melbourne, FL     | 21                       | 3423                                   |
|             | Mobile, AL        | 21                       | 1925                                   |
|             | Montgomery, AL    | 28                       | 1568                                   |
|             | ← Pensacola, FL   | 7                        | 1141                                   |
|             | * Tallahassee, FL | 56                       | 3136                                   |
| Raleigh, NC | Asheville, NC     | 28                       | 2520                                   |
|             | → Columbia, SC    | 7                        | 392                                    |
|             | Daytona Bch. FL   | 14                       | 1533                                   |
|             | Greenville, SC    | 21                       | 1260                                   |
|             | Huntsville, AL    | 14                       | 2282                                   |
|             | Knoxville, TN     | 28                       | 1680                                   |
|             | Lexington, KY     | 21                       | 1050                                   |
|             | ← Little Rock, AR | 7                        | 392                                    |
|             | → Melbourne, FL   | 14                       | 2282                                   |
|             | * Richmond, VA    | 56                       | 5586                                   |

\* Medium frequency

+ Commuter

\*\* High frequency

← One direction only

TABLE 7-6  
DIRECT FLIGHTS BETWEEN SMALL HUBS<sup>(1)</sup>

| City-pair       |                   | Total<br># of<br>Flights | Estimated<br># of<br>passenger<br>seats |
|-----------------|-------------------|--------------------------|-----------------------------------------|
| Augusta, GA     | ← Columbus, GA    | 7                        | 392                                     |
|                 | * Columbia, SC    | 56                       | 4662                                    |
|                 | ← Chattanooga, TN | 7                        | 392                                     |
|                 | Charleston, SC    | 21                       | 2674                                    |
|                 | Knoxville, TN     | 21                       | 1176                                    |
|                 | Lexington, KY     | 21                       | 1176                                    |
|                 | Savannah, GA      | 28                       | 2317                                    |
| Asheville, NC   | Charleston, WV    | 21                       | 3423                                    |
|                 | Fayetteville, NC  | 21                       | 1876                                    |
|                 | Greenville, SC    | 14                       | 860                                     |
|                 | Knoxville, TN     | 28                       | 1624                                    |
|                 | * Roanoke, VA     | 42                       | 5404                                    |
|                 | Richmond, VA      | 14                       | 1260                                    |
|                 | → Lexington, KY   | 7                        | 315                                     |
| Baton Rouge, LA | Columbus, GA      | 14                       | 784                                     |
|                 | ← Knoxville, TN   | 7                        | 392                                     |
| Columbus, GA    | ← Chattanooga, TN | 7                        | 392                                     |
|                 | Jackson, MS       | 28                       | 1568                                    |
|                 | ← Montgomery, AL  | 14                       | 784                                     |
|                 | Mobile, AL        | 21                       | 1176                                    |
|                 | Savannah, GA      | 14                       | 784                                     |
|                 | Tallahassee, FL   | 28                       | 1568                                    |
| Columbia, SC    | ← Chattanooga, TN | 7                        | 392                                     |
|                 | * Charleston, SC  | 56                       | 3808                                    |
|                 | ← Knoxville, TN   | 7                        | 392                                     |
|                 | ← Lexington, KY   | 7                        | 392                                     |
| Chattanooga, TN | Huntsville, AL    | 14                       | 784                                     |
|                 | * Knoxville, TN   | 70                       | 7063                                    |
|                 | Lexington, KY     | 14                       | 784                                     |
|                 | ← Montgomery, AL  | 7                        | 392                                     |
|                 | ← Savannah, GA    | 14                       | 784                                     |
| Charleston, SC  | → Mobile, AL      | 7                        | 1141                                    |
|                 | → Pensacola, FL   | 7                        | 1141                                    |
|                 | → Tallahassee, FL | 7                        | 1141                                    |

TABLE 7-6 (continued)

| City-pair           |                                              | Total<br># of<br>flights | Estimated<br># of<br>passenger<br>seats |
|---------------------|----------------------------------------------|--------------------------|-----------------------------------------|
| Charleston, SC ← *  | Daytona Bch. FL<br>Savannah, GA              | 7<br>63                  | 1141<br>9520                            |
| Charleston, WV →    | Knoxville, TN<br>Roanoke, VA<br>Richmond, VA | 7<br>35<br>28            | 420<br>1995<br>1470                     |
| Daytona Beach, FL → | Mobile, AL                                   | 7                        | 1141                                    |
| →                   | Pensacola, FL                                | 7                        | 1141                                    |
| ←                   | Montgomery, AL                               | 7                        | 392                                     |
| Fayetteville, NC →  | Richmond, VA                                 | 6                        | 720                                     |
| →                   | Greenville, SC                               | 14                       | 840                                     |
| ←                   | Roanoke, PA                                  | 7                        | 1141                                    |
| →                   | Lexington, KY                                | 7                        | 315                                     |
| Greenville, SC →    | Richmond, VA                                 | 13                       | 780                                     |
| ←                   | Huntsville, AL                               | 7                        | 392                                     |
| ←                   | Jackson, MS                                  | 7                        | 392                                     |
| →                   | Knoxville, TN                                | 28                       | 1680                                    |
| →                   | Mobile, AL                                   | 14                       | 392                                     |
| Huntsville, AL ←    | Jackson, MS                                  | 14                       | 784                                     |
| ←                   | Knoxville, TN                                | 35                       | 4200                                    |
| ←                   | Mobile, AL                                   | 21                       | 1176                                    |
| Jackson, MS ←       | Columbia, SC                                 | 7                        | 392                                     |
| ←                   | Montgomery, AL                               | 28                       | 2317                                    |
| ←                   | Mobile, AL                                   | 14                       | 784                                     |
| ←                   | Little Rock, AR                              | 7                        | 392                                     |
| Knoxville, TN →     | Richmond, VA                                 | 20                       | 1200                                    |
| →                   | Lexington, KY                                | 28                       | 1568                                    |
| →                   | Roanoke, VA                                  | 14                       | 840                                     |
| →                   | Savannah, GA                                 | 21                       | 1925                                    |
| ←                   | Montgomery, AL                               | 7                        | 392                                     |
| Lexington, KY       | Roanoke, VA                                  | 28                       | 2310                                    |
| →                   | Richmond, VA                                 | 14                       | 1474                                    |
| Montgomery, AL ←    | Pensacola, FL                                | 7                        | 392                                     |
| →                   | Tallahassee, FL                              | 14                       | 784                                     |
| →                   | Mobile                                       | 7                        | 392                                     |
| Little Rock, AR ←   | Evansville, IN                               | 14                       | 784                                     |

TABLE 7-6 (continued)

| City-pair     |   | Total<br># of<br>Flights | Estimated<br># of<br>passenger<br>seats |
|---------------|---|--------------------------|-----------------------------------------|
| Mobile, AL    | ← | 7                        | 1141                                    |
|               | * | 49                       | 7987                                    |
|               |   | 14                       | 2282                                    |
| Melbourne, FL | → | 7                        | 1141                                    |
| Pensacola, FL |   | 14                       | 2282                                    |
| Roanoke, VA   | * | 70                       | 6300                                    |
|               |   | 35                       | 1995                                    |
| Richmond, VA  |   | 28                       | 1470                                    |
| Sarasota, FL  | ← | 7                        | 1141                                    |
|               | ← | 7                        | 1141                                    |

→ One direction only

(1) See footnote on Table 4-3

\* Medium frequency

TABLE 7-7

DIRECT FLIGHTS BETWEEN LARGE AND NON-HUBS<sup>(1)</sup>

| City Pair           |                    | # of flights | Estimated # of passenger seats |
|---------------------|--------------------|--------------|--------------------------------|
| Large Hub           | Non-Hub            |              |                                |
| New Orleans, LA **+ | Gulfport, MS       | 242          | ++                             |
|                     | ← Macon, GA        | 7            | 392                            |
|                     | Alexandria, LA     | 33           | 994                            |
|                     | Panama City, FL    | 35           | 6135                           |
|                     | * Monroe, LA       | 42           | 2352                           |
|                     | → Dothan, AL       | 28           | 1568                           |
|                     | → Eglin A.F.B., FL | 28           | 1568                           |
| St. Louis, MO       | Monroe, LA         | 14           | 784                            |
|                     | Bristol, TN        | 14           | 784                            |
|                     | Gulfport, MS       | 21           | 1176                           |
|                     | ← Dothan, AL       | 7            | 392                            |
| Tampa, FL *+        | Gainesville, FL    | 69           | 1926                           |
|                     | Panama City, FL    | 21           | 3423                           |

(1) See footnote on Table 4-3

+ Commuter carrier

++ Aircraft type varies

→ One direction

\* Medium frequency

\*\* High frequency

TABLE 7-8

DIRECT FLIGHTS BETWEEN MEDIUM AND NON-HUBS<sup>(1)</sup>

| City-Pair          |                     | # of flights | Estimated # of passenger seats |
|--------------------|---------------------|--------------|--------------------------------|
| Birmingham, AL     | → Columbus, MS      | 7            | 392                            |
|                    | → Macon, GA         | 7            | 392                            |
|                    | Monroe, LA          | 14           | 784                            |
|                    | → Tuscaloosa, AL    | 7            | 392                            |
| Charlotte, NC      | ← Alexandria, LA    | 7            | 392                            |
|                    | Bristol, TN         | 28           | 1470                           |
|                    | Florence, SC        | 34           | ++                             |
|                    | ← Gainesville, FL   | 7            | 392                            |
|                    | * + Hickory, NC     | 42           | 1150                           |
|                    | Myrtle Beach, SC    | 28           | 1470                           |
|                    | Wilmington, NC      | 21           | 1155                           |
| Cincinnati, OH     | * Bristol, TN       | 55           | 3000                           |
|                    | * Huntington, WV    | 56           | 4291                           |
|                    | → Kinston, NC       | 7            | 315                            |
|                    | Lynchburg, VA       | 20           | 1200                           |
|                    | → Macon, GA         | 7            | 392                            |
|                    | Myrtle Beach, SC    | 20           | 900                            |
|                    | New Bern, NC        | 14           | 840                            |
|                    | * Wilmington, NC    | 42           | 2310                           |
|                    | Winston Salem, NC   | 21           | 1155                           |
| Columbus, OH       | Bristol, TN         | 14           | 840                            |
|                    | ← Gainesville, FL   | 7            | 392                            |
|                    | Myrtle Beach, SC    | 14           | 840                            |
| Greensboro, NC     | Bristol, TN         | 14           | 630                            |
|                    | Huntington, WV      | 14           | 630                            |
|                    | Kinston, NC         | 14           | 630                            |
|                    | Myrtle Beach, SC    | 28           | 1470                           |
|                    | ← New Bern, NC      | 7            | 315                            |
|                    | Wilmington, NC      | 14           | 630                            |
| Jacksonville, FL * | Gainesville, FL     | 63           | 945                            |
|                    | Panama City, FL     | 28           | 4564                           |
|                    | Valdosta, GA        | 14           | 532                            |
| Louisville, KY     | Ashland, KY         | 14           | 1680                           |
|                    | Bristol, TN         | 35           | 1890                           |
|                    | ← Kinston, NC       | 7            | 315                            |
|                    | → Lynchburg, VA     | 7            | 420                            |
|                    | ← Myrtle Beach, SC  | 7            | 420                            |
|                    | → New Bern, NC      | 14           | 735                            |
|                    | Wilmington, NC      | 21           | 1155                           |
|                    | ← Winston Salem, NC | 14           | 735                            |

TABLE 7-8 (continued)

| City-Pair     |                    | # of flights | Estimated # of passenger seats |
|---------------|--------------------|--------------|--------------------------------|
| Memphis, TN   | Alexandria, La     | 14           | 280                            |
|               | Bristol, TN        | 39           | 2184                           |
|               | * Columbus, MS     | 42           | 2100                           |
|               | Dothan, AL         | 14           | 784                            |
|               | Eglin, A.F.B., FL  | 28           | 1568                           |
|               | Gulfport, MS       | 35           | 1960                           |
|               | Meridan, MS        | 14           | 784                            |
|               | * Monroe, LA       | 53           | 2952                           |
|               | Muscle Shoals, AL  | 14           | 532                            |
|               | Tuscaloosa, AL     | 35           | 1456                           |
| Nashville, TN | Bristol, TN        | 31           | 1646                           |
|               | + Gulfport, MS     | 7            | 392                            |
| Orlando, FL   | * Eglin A.F.B., FL | 42           | 2352                           |
|               | Dothan, AL         | 14           | 784                            |
|               | Panama City, FL    | 35           | 2709                           |
| Raleigh, NC   | Bristol, TN        | 28           | 1470                           |
|               | Kinston, NC        | 14           | 630                            |
|               | New Bern, NC       | 21           | 1155                           |
|               | Wilmington, NC     | 28           | 1470                           |
|               | Winston-Salem, NC  | 14           | 840                            |

+ Commuter carrier

++ Type of A/C vary

+ One Direction

\* Medium Frequency

(1) See footnote on Table 4-3.



TABLE 7-9  
DIRECT FLIGHTS BETWEEN SMALL AND NON-HUBS<sup>(1)</sup>

| City-Pair              |                     | # of flights | Estimated # of passenger seats |
|------------------------|---------------------|--------------|--------------------------------|
| S-Hub                  | N-Hub               |              |                                |
| Asheville, NC<br>←     | Bristol, TN         | 28           | 2310                           |
|                        | Charlottesville, VA | 7            | 840                            |
|                        | Lynchburg, VA       | 20           | 1875                           |
|                        | Myrtle Beach, SC    | 14           | 630                            |
|                        | Wilmington, NC      | 7            | 315                            |
|                        | Winston Salem, NC   | 20           | 1875                           |
| Augusta, GA<br>←       | Myrtle Beach, SC    | 20           | 1200                           |
|                        | Wilmington, NC      | 6            | 360                            |
| Baton Rouge, LA *<br>* | Alexandria, LA      | 56           | 3136                           |
|                        | Monroe, LA          | 42           | 2352                           |
| Charleston, WV *       | Ashland, WV         | 48           | 4185                           |
|                        | Bristol, TN         | 20           | 1950                           |
|                        | Myrtle Beach, SC    | 28           | 1470                           |
| Chattanooga, TN        | Bristol, TN         | 14           | 784                            |
| Columbus, GA<br>←      | Albany, GA          | 14           | 784                            |
|                        | Alexandria, LA      | 7            | 392                            |
|                        | Dothan, AL          | 28           | 1568                           |
|                        | Eglin A.F. Base, FL | 28           | 1568                           |
|                        | Gulfport, MS        | 14           | 784                            |
|                        | Panama City, FL     | 14           | 784                            |
|                        | Valdosta, GA        | 21           | 798                            |
| Fayetteville, NC<br>←  | Bristol, TN         | 34           | 2190                           |
|                        | Florence, SC        | 7            | 840                            |
|                        | Kinston, NC         | 14           | 1680                           |
|                        | Myrtle Beach, SC    | 14           | 630                            |
|                        | Wilmington, NC      | 47           | 4275                           |
| Greenville, SC<br>→    | Bristol, TN         | 14           | 840                            |
|                        | Gulfport, MS        | 7            | 392                            |
|                        | Wilmington, NC      | 14           | 840                            |
| Huntsville, TN →       | Gulfport, MS        | 7            | 392                            |
|                        | Muscle Shoals, AL   | 28           | 1568                           |
| Jackson, MS            | Alexandria, LA      | 14           | 120                            |
|                        | Eglin A.F. Base, FL | 14           | 784                            |
|                        | Meridian, MS        | 14           | 784                            |
|                        | Monroe, LA          | 28           | 2317                           |

TABLE 7-9 (continued)

| City-Pair         |                     | # of flights | Estimated # of passenger seats |
|-------------------|---------------------|--------------|--------------------------------|
| S-Hub             | N-Hub               |              |                                |
| Knoxville, TN *   | Bristol, TN         | 54           | 3136                           |
|                   | Lynchburg, VA       | 7            | 420                            |
|                   | Winston Salem, NC   | 34           | 2100                           |
| Lexington, KY     | Bristol, TN         | 28           | 1365                           |
|                   | Kinston, NC         | 14           | 630                            |
|                   | Myrtle Beach, SC    | 7            | 315                            |
|                   | New Bern, NC        | 14           | 735                            |
|                   | Wilmington, NC      | 28           | 1365                           |
|                   | Winston Salem, NC   | 14           | 735                            |
| Mobile, AL *      | Eglin A.F. Base, FL | 35           | 4207                           |
|                   | Gulfport, MS        | 56           | 3136                           |
|                   | Panama City, FL     | 35           | 5707                           |
| Richmond, VA *    | Bristol, TN         | 110          | 10500                          |
|                   | Lynchburg, VA       | 14           | 840                            |
|                   | Wilmington, NC      | 18           | 900                            |
| Roanoke, VA *     | Bristol, TN         | 84           | 8820                           |
|                   | Charlottesville, VA | 13           | 2119                           |
|                   | Huntington, WV      | 42           | 3661                           |
|                   | Lynchburg, VA       | 48           | 2670                           |
|                   | Myrtle Beach, SC    | 21           | 2255                           |
|                   | Winston Salem, NC   | 41           | 4310                           |
| Pensacola, FL     | Panama City, FL     | 35           | 5705                           |
| Sarasota, FL +*   | Gainesville, FL     | 52           | 1372                           |
| Tallahassee, FL → | Dothan, AL          | 7            | 392                            |
|                   | Eglin A.F. Base, FL | 28           | 1568                           |
|                   | Gainesville, FL     | 20           | 160                            |
|                   | Panama City, FL     | 21           | 1624                           |

← One direction

\* Medium frequency

+ Commuter carrier

(1) See footnotes on Table 4-3

TABLE 7-10  
DIRECT FLIGHTS BETWEEN NON-HUBS<sup>(1)</sup>

| City-Pair           |                                                                                                         | Total<br># of<br>flights        | Estimated<br># of<br>passenger<br>seats   |
|---------------------|---------------------------------------------------------------------------------------------------------|---------------------------------|-------------------------------------------|
| Albany, GA          | Dothan, AL<br>Eglin A.F.B., FL                                                                          | 28<br>14                        | 1568<br>784                               |
| Alexandria, LA      | Monroe, LA                                                                                              | 12                              | 120                                       |
| Ashland, KY         | Bristol, TN<br>Lynchburg, VA<br>Myrtle Beach, SC                                                        | 13<br>21<br>21                  | 585<br>1260<br>945                        |
| Bristol, TN         | Kinston, NC<br>Lynchburg, VA<br>Myrtle Beach, SC<br>New Bern, NC<br>Wilmington, NC<br>Winston Salem, NC | 14<br>7<br>14<br>21<br>56<br>27 | 630<br>420<br>630<br>1155<br>3465<br>2401 |
| Brunswick, GA       | Hilton Head, SC<br>Waycross, GA                                                                         | 63<br>28                        | 2464<br>1288                              |
| Charlottesville, VA | Hickory, NC<br>Lynchburg, VA<br>Winston Salem, NC                                                       | 21<br>27<br>21                  | 1575<br>1515<br>1575                      |
| Columbus, MS        | Meridan MS<br>Tuscaloosa, AL                                                                            | 28<br>33                        | 1568<br>1652                              |
| Dothan, AL          | Eglin A.F.B., FL<br>Gulfport, MS<br>Panama City, FL                                                     | 56<br>21<br>14                  | 3136<br>1176<br>784                       |
| Elgin A.F.B., FL    | Gulport, MS<br>Panama City, FL                                                                          | 21<br>28                        | 1176<br>1568                              |
| Florence, SC        | Jacksonville, NC<br>Kinston, NC<br>Myrtle Beach, SC<br>New Bern, NC<br>Wilmington, NC                   | 7<br>14<br>14<br>14<br>7        | 420<br>1260<br>840<br>840<br>420          |

TABLE 7-10 (continued)

| City-Pair             |                   | Total<br># of<br>flights | Estimated<br># of<br>passenger<br>seats |
|-----------------------|-------------------|--------------------------|-----------------------------------------|
| Hickory, NC           | Lynchburg, VA     | 14                       | 630                                     |
|                       | Winston-Salem, NC | 28                       | 1515                                    |
| Jacksonville, NC      | Myrtle Beach, SC  | 14                       | 840                                     |
|                       | Wilmington, NC    | 21                       | 1260                                    |
| Kinston, NC<br>+<br>← | Myrtle Beach, SC  | 14                       | 840                                     |
|                       | New Bern, NC      | 7                        | 315                                     |
|                       | Wilmington, NC    | 21                       | 1050                                    |
| Lynchburg, VA<br>←    | Winston Salem, NC | 28                       | 2415                                    |
|                       | Wilmington, NC    | 7                        | 840                                     |
| Myrtle Beach, SC      | New Bern, NC      | 14                       | 840                                     |
|                       | Wilmington, NC    | 28                       | 1575                                    |
| New Bern, NC          | Wilmington, NC    | 34                       | 1935                                    |
|                       | Winston Salem, NC | 14                       | 840                                     |

(1) See footnotes on Table 4-3.

+ Commuter carrier

← One direction only

\* Medium frequency

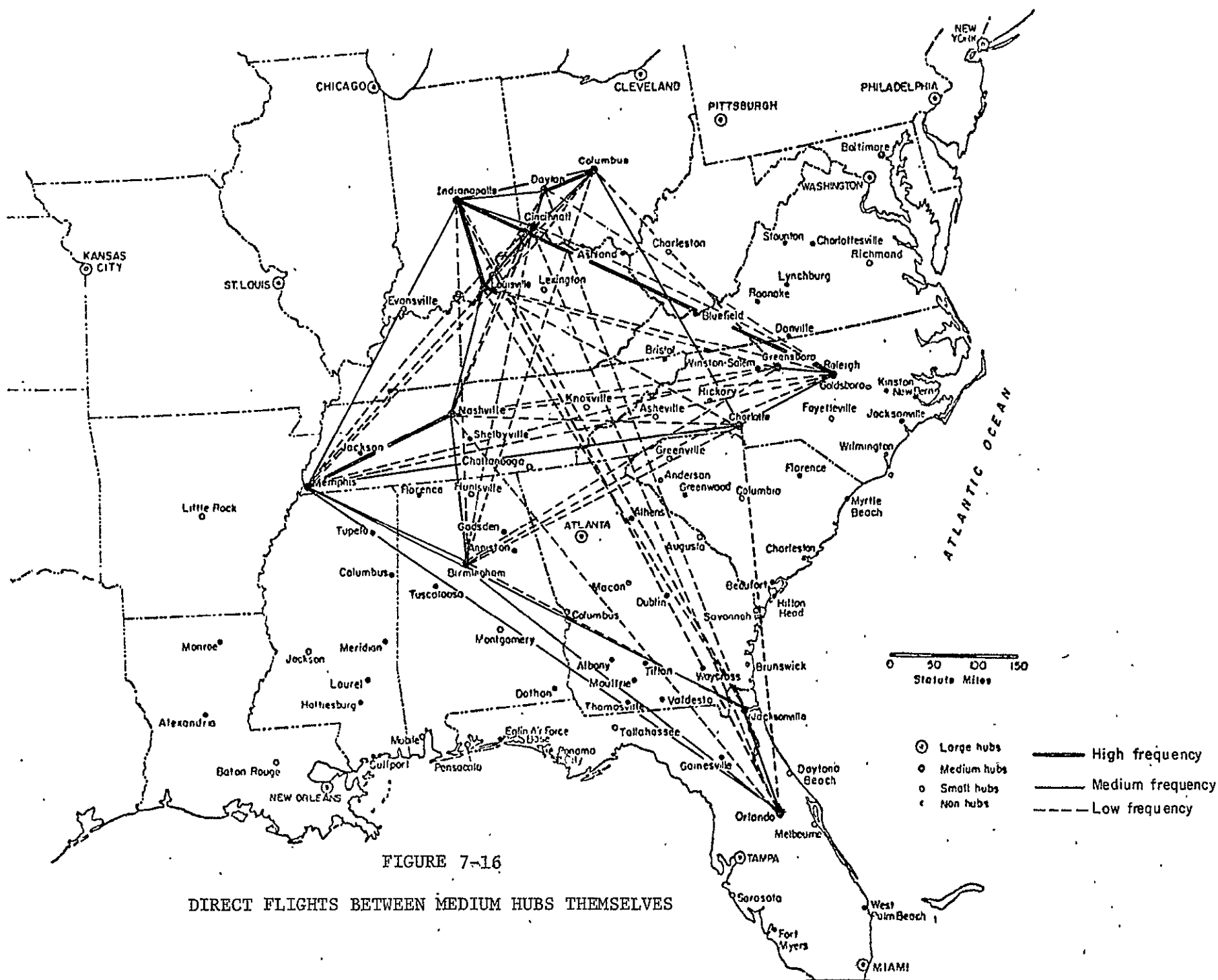


FIGURE 7-16

DIRECT FLIGHTS BETWEEN MEDIUM HUBS THEMSELVES

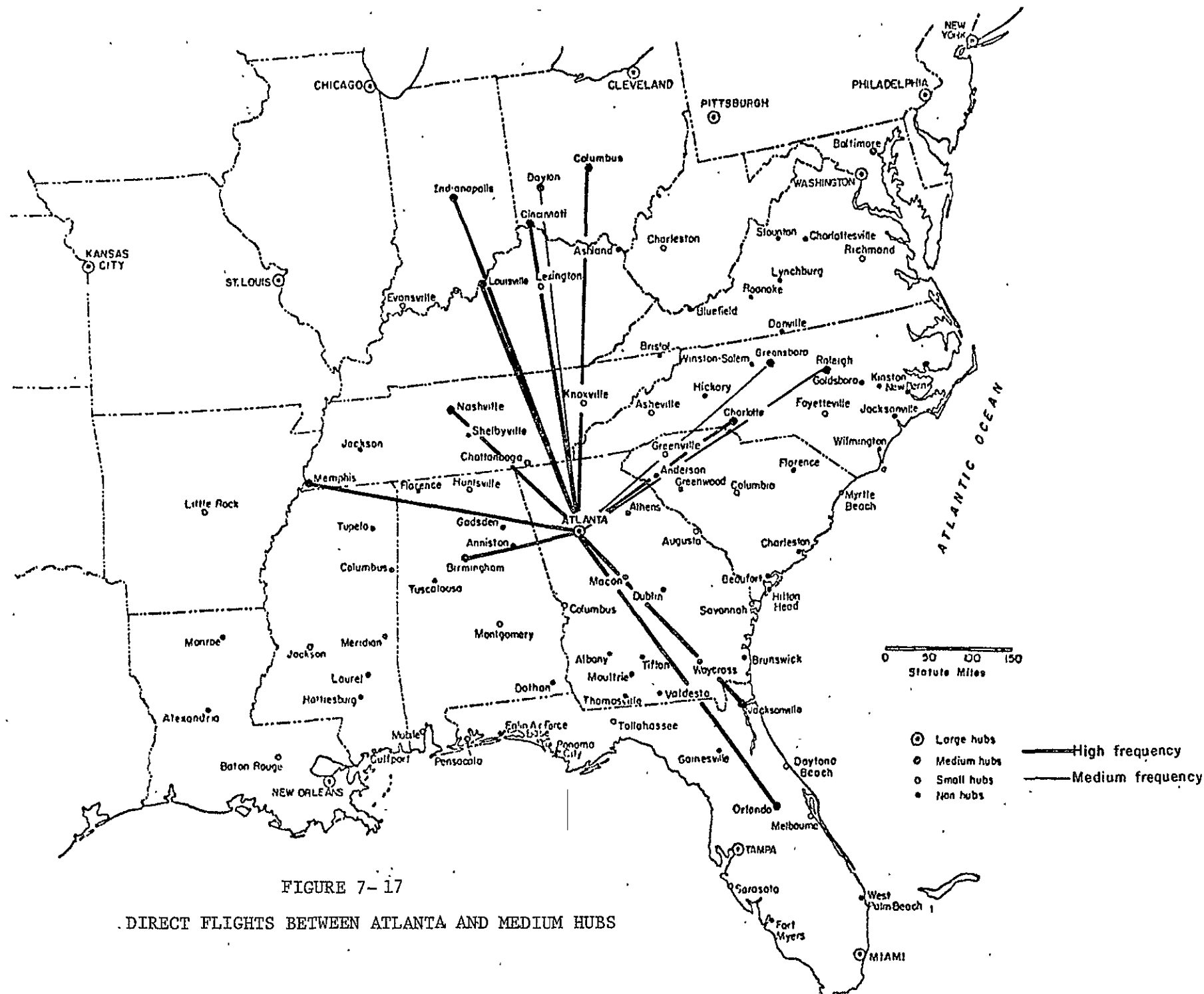


FIGURE 7-17

DIRECT FLIGHTS BETWEEN ATLANTA AND MEDIUM HUBS

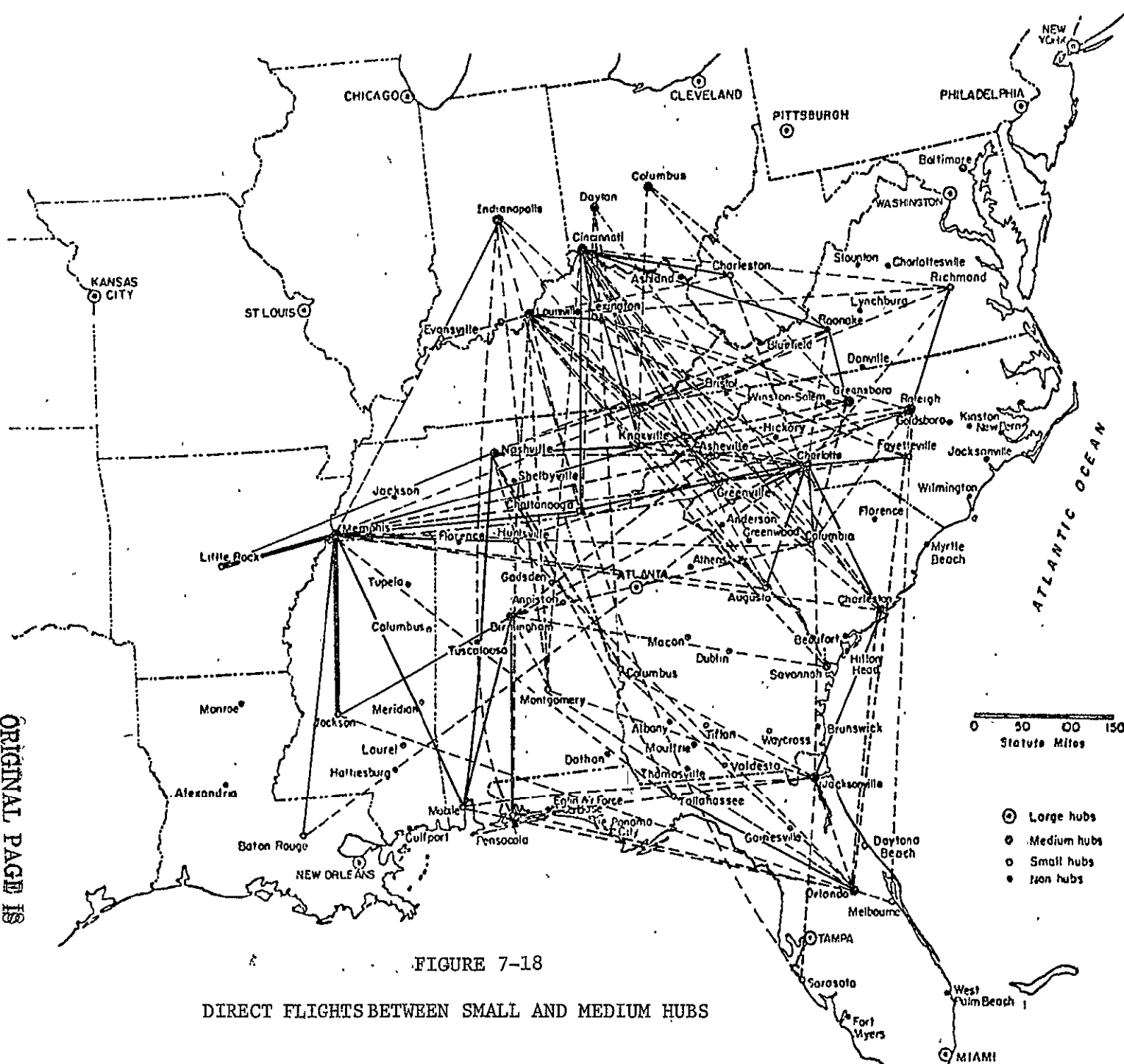


FIGURE 7-18  
DIRECT FLIGHTS BETWEEN SMALL AND MEDIUM HUBS

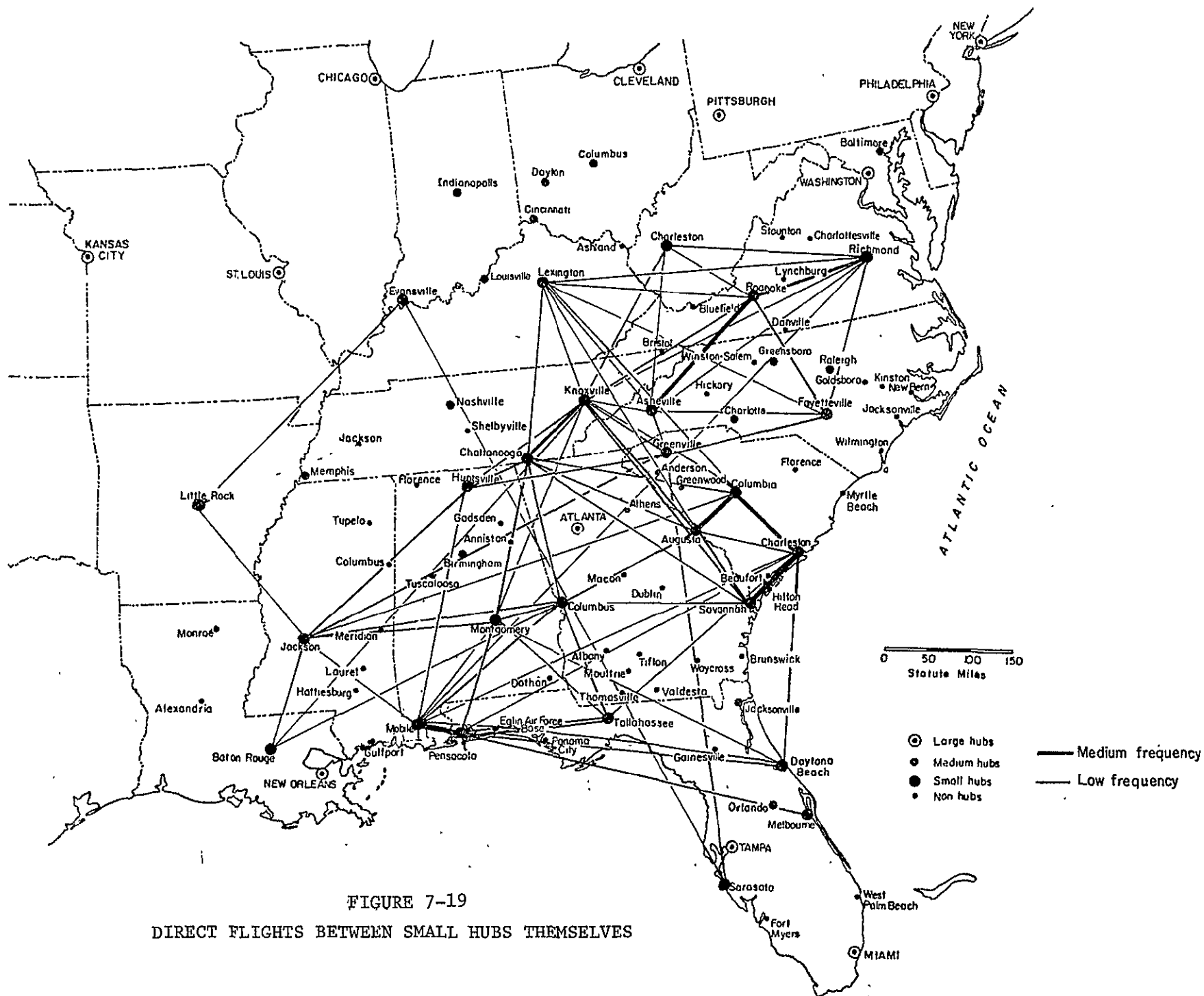


FIGURE 7-19  
DIRECT FLIGHTS BETWEEN SMALL HUBS THEMSELVES



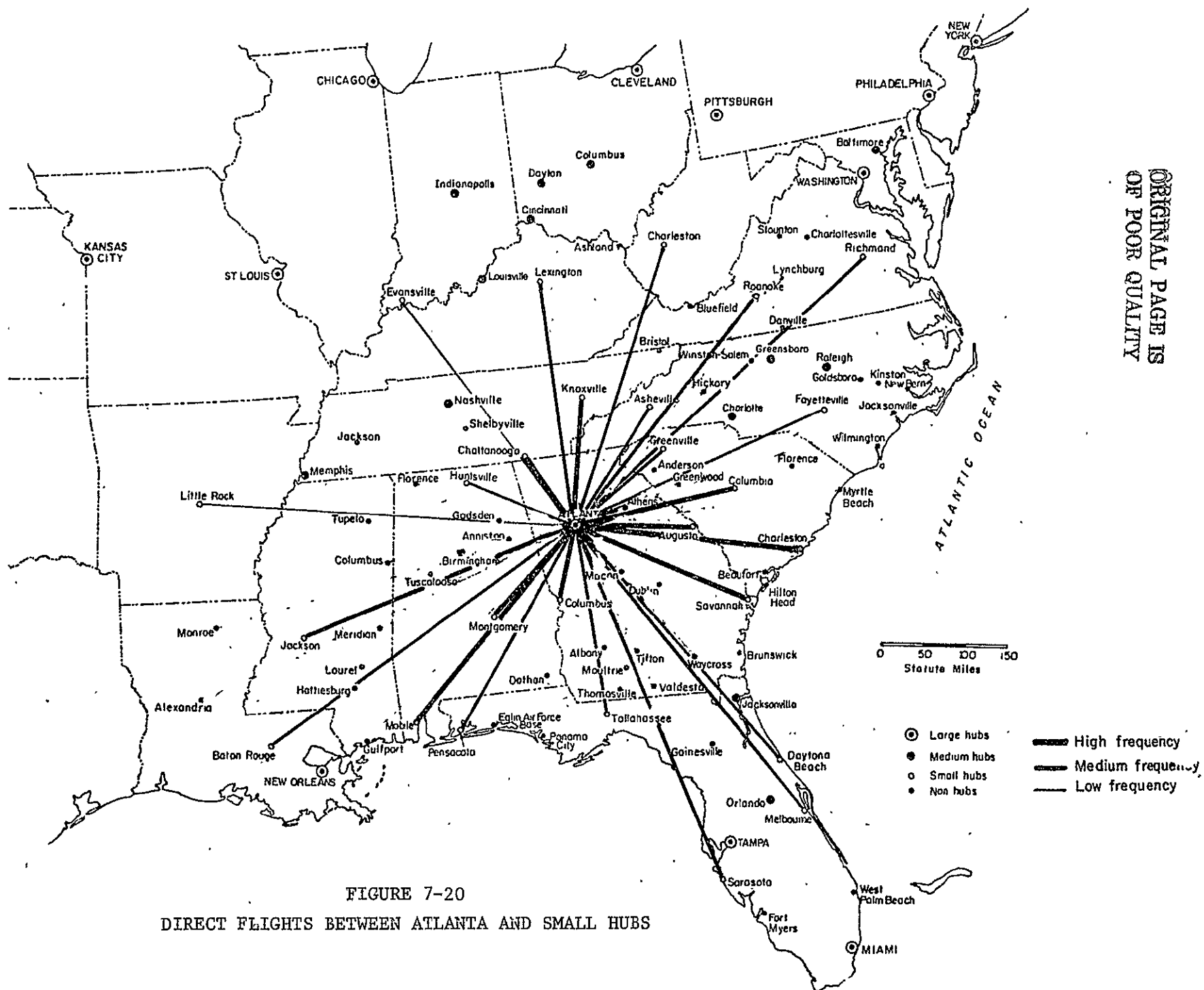


FIGURE 7-20

DIRECT FLIGHTS BETWEEN ATLANTA AND SMALL HUBS

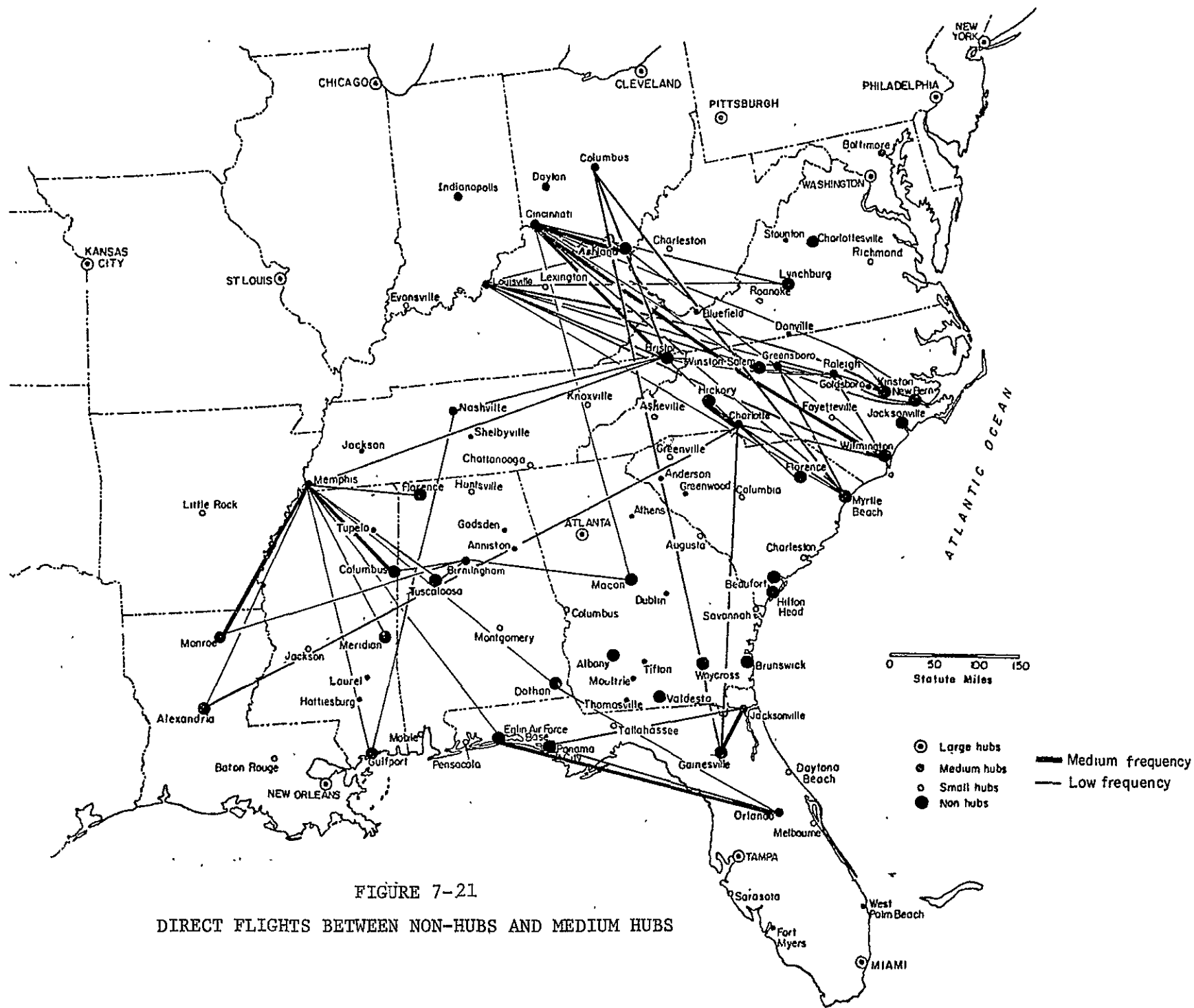


FIGURE 7-21  
DIRECT FLIGHTS BETWEEN NON-HUBS AND MEDIUM HUBS

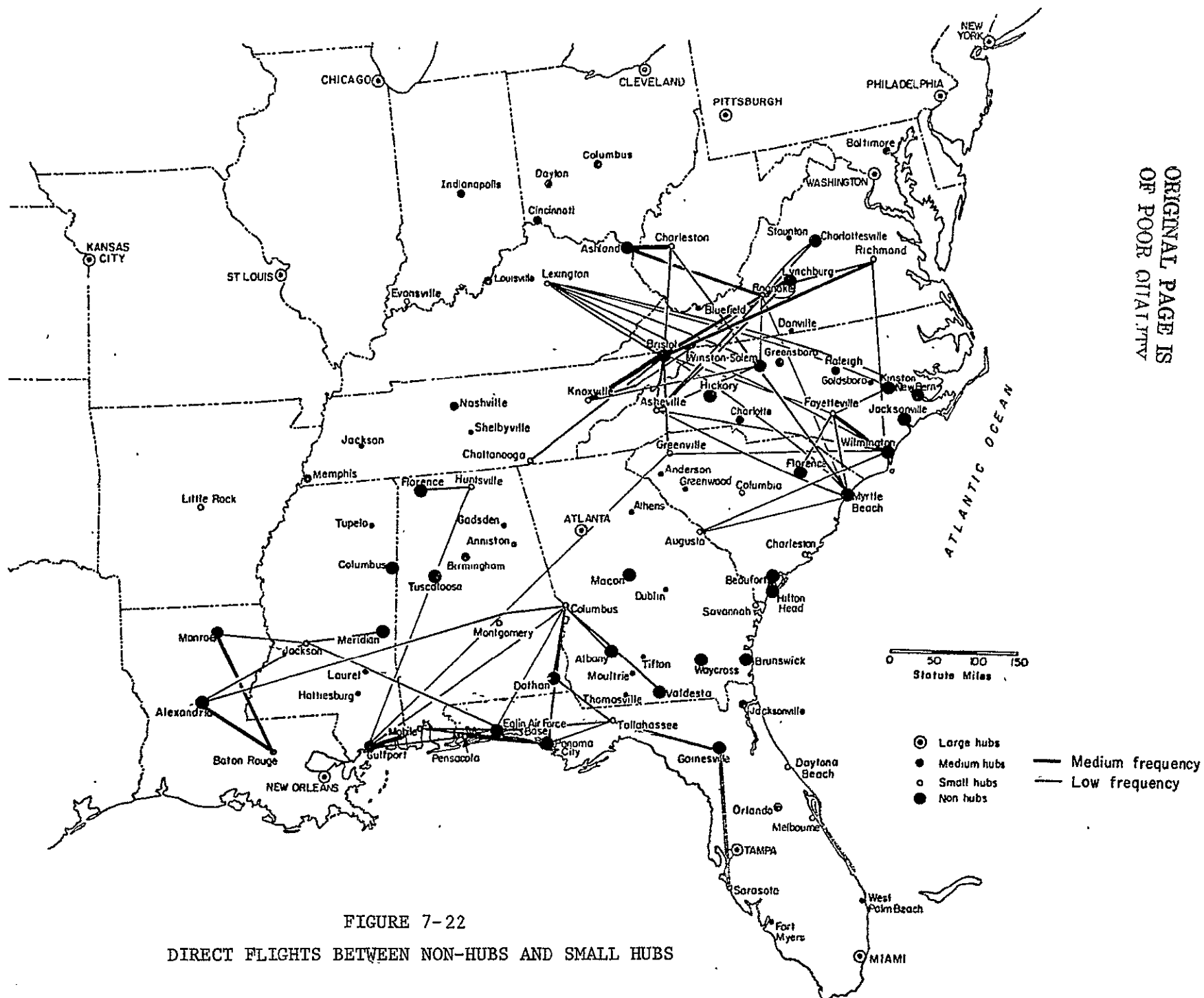
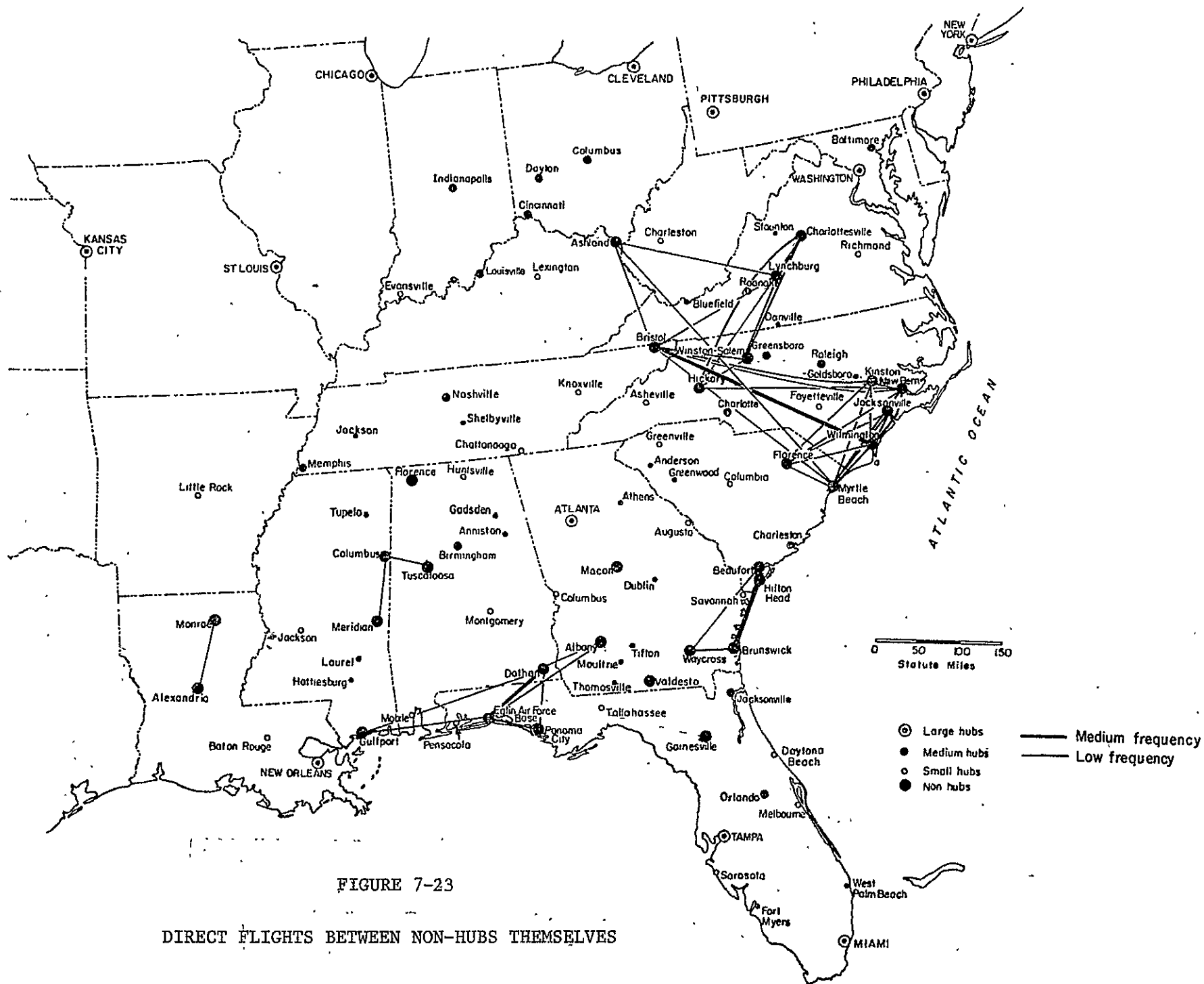


FIGURE 7-22  
DIRECT FLIGHTS BETWEEN NON-HUBS AND SMALL HUBS



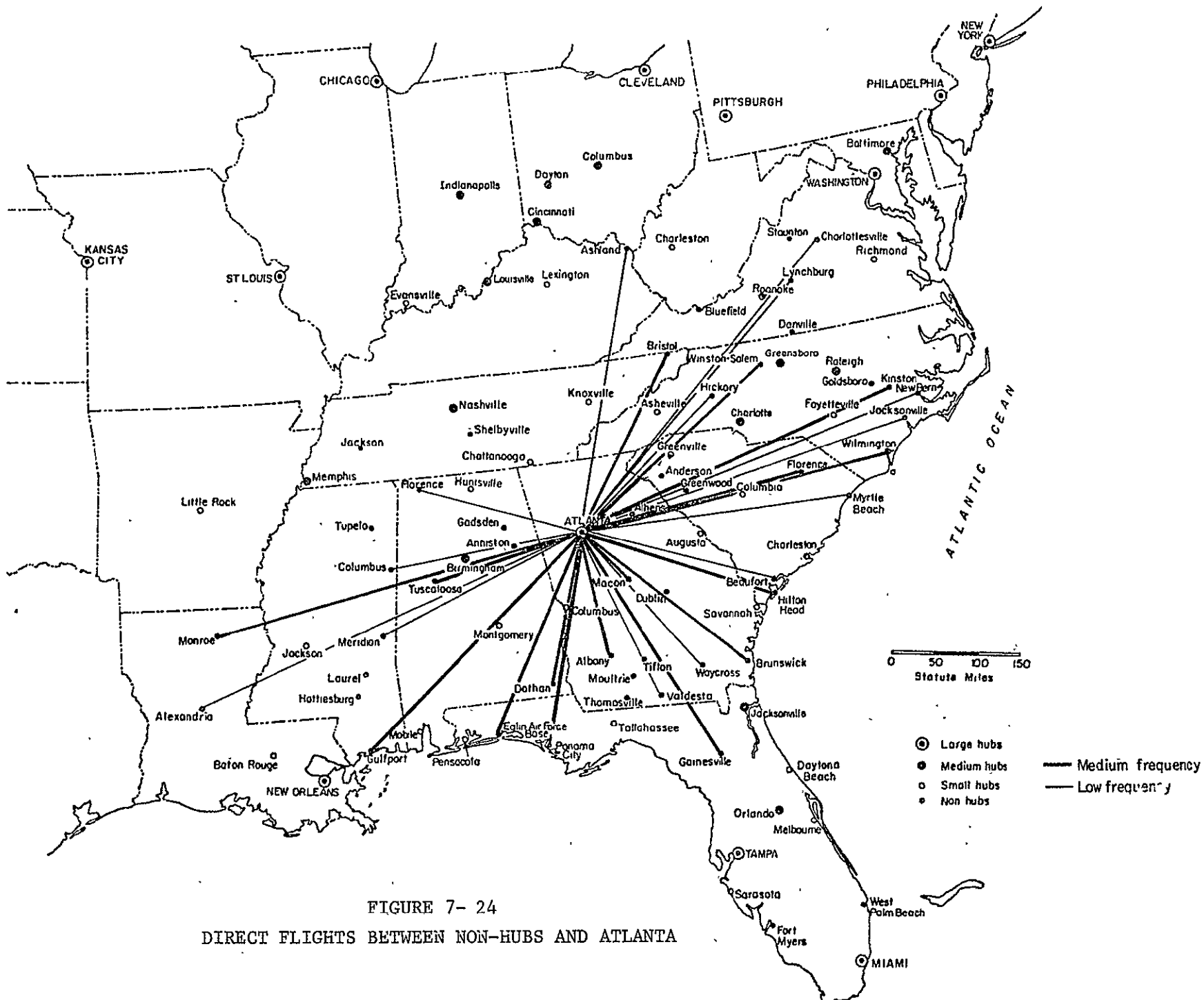


FIGURE 7- 24  
DIRECT FLIGHTS BETWEEN NON-HUBS AND ATLANTA

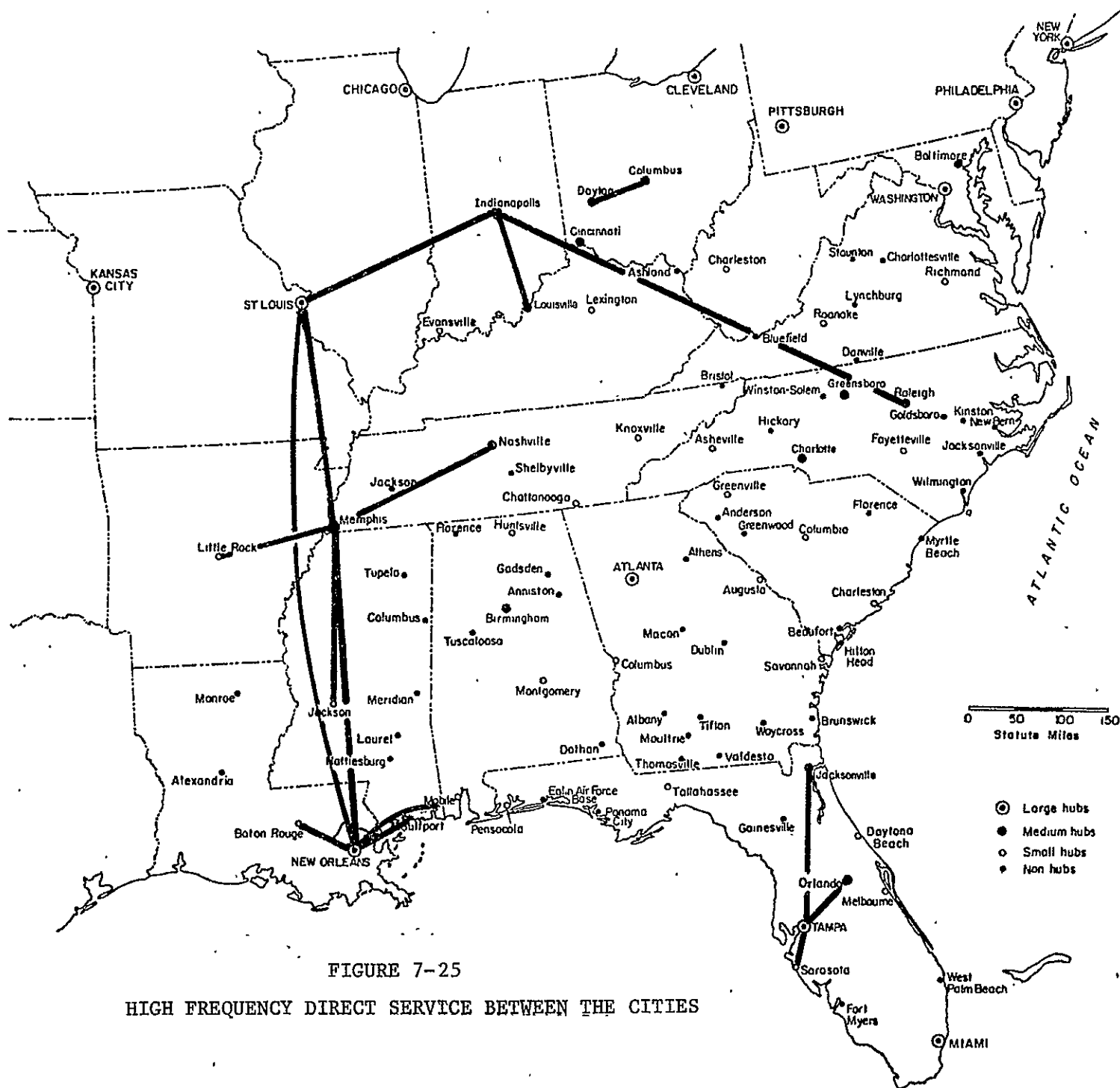


FIGURE 7-25

HIGH FREQUENCY DIRECT SERVICE BETWEEN THE CITIES

serving the non-hubs in the region appear in each case to be made of sub-networks; one for the northeastern sector and one for the southwestern sector with scarce connections between them. This pattern is shown on Figures 7-21 through 7-23. There appears to be a tendency for the network to somehow *shrink* as the sizes of the cities involved become smaller.

High frequency direct connections between the region's cities are shown in Figure 7-25. The pattern is clearly indicative of the absence of direct connections in the directions cross over the center of the region. The reason for this is that all such connections are served via Atlanta and appear as service between the region's cities and Atlanta.

#### Comparison of Traffic and Service Patterns

In general there is a good correlation between city pair traffic and service frequency. However, cities with high and medium service frequencies are not always the cities with the highest traffic volumes. However, all cities having 30,000 to 80,000 origin destination traffic volumes with Atlanta are served with high and medium frequency service to that city.

Origin destination traffic between cities may not be the only reason for the provision of service. A look is therefore necessary at the total traffic between the cities. To do this 33 short haul city pairs in the region with O-D traffic over 20,000 and at distance less than 500 miles are selected for more detailed study. The traffic summary for these cities is shown in Table 7-11.

It can be seen that origin destination traffic is not the predominant component of total traffic for all these cities. Indeed some of the larger cities in the region, such as Memphis appear to serve as connecting hubs

TABLE 7-11

RELATIONSHIP BETWEEN SERVICE FREQUENCY AND  
PERCENTAGE OF O-D PASSENGERS  
FOR SELECTED SHORT HAUL CITY PAIRS (1)

| Short Haul<br>City-Pairs          | Distance<br>(miles) | Service<br>freq. | Total<br># of<br>passengers | O-D passengers |                        | # of<br>connecting<br>passengers |
|-----------------------------------|---------------------|------------------|-----------------------------|----------------|------------------------|----------------------------------|
|                                   |                     |                  |                             | # of<br>pass.  | % of<br>total<br>pass. |                                  |
| Birmingham, AL - Jacksonville, FL | 365                 | L                | 22,160                      | 20,860         | 94.1                   | 1,300                            |
| " - Memphis, TN                   | 212                 | M                | 57,580                      | 29,830         | 51.8                   | 27,750                           |
| " - Mobile, AL                    | 216                 | M                | 41,170                      | 36,890         | 89.6                   | 4,280                            |
| " - New Orleans, LA               | 321                 | M                | 54,760                      | 37,230         | 68.0                   | 17,530                           |
| " - Orlando, FL                   | 475                 | M                | 28,910                      | 26,450         | 91.5                   | 2,460                            |
| Charlotte, NC - Nashville, TN     | 329                 | L                | 28,270                      | 20,850         | 73.8                   | 7,420                            |
| " - Raleigh, NC                   | 130                 | M                | 55,310                      | 23,690         | 42.8                   | 31,620                           |
| Chattanooga, IN - Memphis, TN     | 271                 | M                | 35,290                      | 21,840         | 61.9                   | 13,450                           |
| Cincinnati, OH - Memphis, TN      | 403                 | L                | 52,360                      | 25,260         | 48.2                   | 27,100                           |
| " - Nashville, TN                 | 230                 | L                | 35,550                      | 28,080         | 70.5                   | 10,470                           |
| " - St. Louis, MO                 | 308                 | M                | 109,580                     | 52,610         | 48.0                   | 56,970                           |
| Columbus, OH - St. Louis, MO      | 410                 | M                | 66,910                      | 35,720         | 53.4                   | 31,190                           |
| Dayton, OH - St. Louis, MO        | 339                 | M                | 73,880                      | 34,050         | 46.1                   | 39,830                           |
| Evansville, TN - Indianapolis, IN | 135                 | M                | 72,320                      | 33,340         | 46.1                   | 38,980                           |
| Indianapolis, IN - Memphis, TN    | 381                 | M                | 58,130                      | 27,740         | 39.1                   | 35,390                           |
| " - St. Louis, MO                 | 229                 | H                | 140,360                     | 51,690         | 36.8                   | 88,670                           |
| Jackson, MS - Memphis, TN         | 189                 | H                | 92,600                      | 28,690         | 31.0                   | 63,910                           |
| Jacksonville, FL - Tampa, FL      | 184                 | H                | 46,150                      | 28,820         | 62.4                   | 17,330                           |
| Knoxville, TN - Memphis, TN       | 342                 | M                | 51,440                      | 36,700         | 71.3                   | 14,740                           |
| " - Nashville, TN                 | 152                 | M                | 26,780                      | 21,720         | 81.1                   | 5,060                            |
| Little Rock, AR - Memphis, TN     | 130                 | H                | 146,980                     | 22,240         | 15.1                   | 124,740                          |
| " - St. Louis, MO                 | 296                 | M                | 63,480                      | 38,290         | 60.3                   | 25,190                           |
| Louisville, KY - Memphis, TN      | 319                 | L                | 40,350                      | 26,350         | 65.3                   | 14,000                           |
| " - St. Louis, MO                 | 254                 | M                | 95,870                      | 44,680         | 46.6                   | 51,190                           |
| Memphis, TN - Nashville, TN       | 200                 | H                | 139,120                     | 67,390         | 48.4                   | 71,730                           |
| " - New Orleans, LA               | 349                 | H                | 129,040                     | 69,390         | 53.8                   | 59,650                           |
| " - St. Louis, MO                 | 255                 | H                | 207,420                     | 71,710         | 34.6                   | 135,710                          |
| Nashville, TN - New Orleans, LA   | 471                 | L                | 23,770                      | 22,590         | 95.0                   | 1,180                            |
| " - St. Louis, MO                 | 271                 | M                | 44,120                      | 29,330         | 66.5                   | 14,790                           |
| New Orleans, LA - Tampa, FL       | 493                 | M                | 72,870                      | 45,870         | 62.9                   | 27,000                           |
| Orlando, FL - Tallahassee, FL     | 225                 | M                | 47,570                      | 40,070         | 84.2                   | 7,500                            |
| Richmond, VA - Roanoke, VA        | 147                 | M                | 45,230                      | 22,950         | 50.7                   | 22,280                           |
| Tallahassee, FL - Tampa, FL       | 206                 | M                | 54,370                      | 44,000         | 80.9                   | 10,370                           |

Note: (1) Traffic data is accessed through I. P. Sharp System for 1974.  
Service data is obtained from O.A.G., September, 1974.



themselves for traffic from smaller cities. Note the small percentages of O-D traffic for Little Rock-Memphis and for Jackson-Memphis. To assess the magnitude of this phenomenon, a comparison is made between direct and indirect origin destination flows between the city pairs. This analysis is shown in Table 7-12. Generally these numbers are quite low indicating that the connecting traffic proportions shown on Table 7-11 may be due to origin destination traffic between the cities involved and cities not included in this comparison, namely smaller hubs and cities with low traffic generation.

There are some cities, however, with unexpectedly high proportions of indirect origin destination flows. New Orleans-Nashville (59%) and New Orleans-Tampa (31%), for example. These cities are shown in Figure 7-26. Except for New Orleans-Tampa, all these cities have relatively low service frequencies, resulting in more connections via Atlanta and Memphis. Some of these patterns are more surprising than others. For example, of the total O-D traffic between Nashville and New Orleans, 34% takes place by connections via Memphis and 24% via Atlanta. For this city pair the difference in travel time between direct and indirect flights are less than one hour making this pattern quite plausible. However, in the case of New Orleans-Tampa, close to 30% of the origin destination traffic takes place by connections via Atlanta which practically doubles the travel time. This pattern needs explanation in other than travel time terms.

In examining the local utilization ratios for the 33 city pairs considered in this section, it is found that these vary between 8.1% and 43.4% and are generally quite low. With the generally low through traffic proportions observed in the region, it seems that a preliminary conclusion

TABLE 7-12

COMPARISON OF INDIRECT O-D TRAFFIC AND SERVICE FREQUENCY  
FOR SELECTED SHORT HAUL CITY PAIRS<sup>(1)</sup>

| Short Haul City Pairs             | Distance<br>(Miles) | Service<br>Frequency | Total #<br>of O-D<br>passengers | # of<br>direct O-D<br>passengers | Indirect O-D<br>passenger |                                 |
|-----------------------------------|---------------------|----------------------|---------------------------------|----------------------------------|---------------------------|---------------------------------|
|                                   |                     |                      |                                 |                                  | #                         | % of<br>total O-D<br>passengers |
| Birmingham, AL - Jacksonville, FL | 365                 | L                    | 20,860                          | 15,670                           | 5,190                     | 24.9                            |
| " - Memphis, TN                   | 212                 | M                    | 29,830                          | 29,580                           | 250                       | 0.8                             |
| " - Mobile, AL                    | 216                 | M                    | 36,890                          | 36,470                           | 420                       | 1.1                             |
| " - New Orleans, LA               | 321                 | M                    | 37,230                          | 34,280                           | 2,950                     | 7.9                             |
| " - Orlando, FL                   | 475                 | M                    | 26,450                          | 22,240                           | 4,210                     | 15.9                            |
| Charlotte, NC - Nashville, TN     | 329                 | L                    | 20,850                          | 18,780                           | 2,070                     | 10.0                            |
| " - Raleigh, NC                   | 130                 | M                    | 23,690                          | 23,690                           | 0                         | 0                               |
| Chattanooga, TN - Memphis, TN     | 271                 | M                    | 21,840                          | 19,750                           | 2,090                     | 9.6                             |
| Cincinnati, OH - Memphis, TN      | 403                 | L                    | 25,080                          | 18,300                           | 6,780                     | 27.0                            |
| " - Nashville, TN                 | 230                 | L                    | 25,260                          | 25,160                           | 100                       | 0.4                             |
| " - St. Louis, MO                 | 308                 | M                    | 52,610                          | 51,440                           | 1,170                     | 2.2                             |
| Columbus, OH - St. Louis, MO      | 410                 | M                    | 35,720                          | 34,240                           | 1,480                     | 4.1                             |
| Dayton, OH - St. Louis, MO        | 339                 | M                    | 34,050                          | 33,390                           | 660                       | 1.9                             |
| Evansville, TN - Indianapolis, IN | 135                 | M                    | 33,340                          | 32,290                           | 50                        | 0.1                             |
| Indianapolis, IN - Memphis, TN    | 381                 | M                    | 27,740                          | 22,410                           | 330                       | 1.5                             |
| " - St. Louis, MO                 | 229                 | H                    | 51,690                          | 51,600                           | 90                        | 0.2                             |
| Jackson, MS - Memphis, TN         | 189                 | H                    | 28,690                          | 28,690                           | 0                         | 0                               |
| Jacksonville, FL - Tampa, FL      | 184                 | H                    | 28,820                          | 28,360                           | 460                       | 1.6                             |
| Knoxville, TN - Memphis, TN       | 342                 | M                    | 36,700                          | 34,410                           | 2,290                     | 6.2                             |
| " - Nashville, TN                 | 152                 | M                    | 21,720                          | 21,720                           | 0                         | 0                               |
| Little Rock, AR - Memphis, TN     | 130                 | H                    | 22,240                          | 22,240                           | 0                         | 0                               |
| " - St. Louis, MO                 | 296                 | M                    | 38,290                          | 33,460                           | 4,830                     | 12.6                            |
| Louisville, KY - Memphis, TN      | 319                 | L                    | 26,350                          | 23,050                           | 3,300                     | 12.5                            |
| " - St. Louis, MO                 | 254                 | M                    | 44,680                          | 44,300                           | 380                       | 0.8                             |
| Memphis, TN - Nashville, TN       | 200                 | H                    | 67,390                          | 67,320                           | 70                        | 0.1                             |
| " - New Orleans, LA               | 349                 | H                    | 69,390                          | 66,790                           | 2,600                     | 3.7                             |
| " - St. Louis, MO                 | 255                 | H                    | 71,710                          | 71,110                           | 600                       | 0.8                             |
| Nashville, TN - New Orleans, LA   | 471                 | L                    | 22,590                          | 9,240                            | 13,350                    | 59.1                            |
| " - St. Louis, MO                 | 271                 | M                    | 29,330                          | 22,430                           | 6,900                     | 23.5                            |
| New Orleans, LA - Tampa, FL       | 493                 | M                    | 45,870                          | 31,650                           | 14,220                    | 31.0                            |
| Orlando, FL - Tallahassee, FL     | 225                 | M                    | 40,070                          | 39,360                           | 710                       | 1.8                             |
| Richmond, VA - Roanoke, VA        | 147                 | M                    | 22,950                          | 22,820                           | 130                       | 0.6                             |
| Tallahassee, FL - Tampa, FL       | 206                 | M                    | 44,000                          | 43,550                           | 450                       | 1.0                             |

Note: (1) Traffic data is accessed through I. P. Sharp System for 1974.  
Service data is obtained from O.A.G., September, 1974.

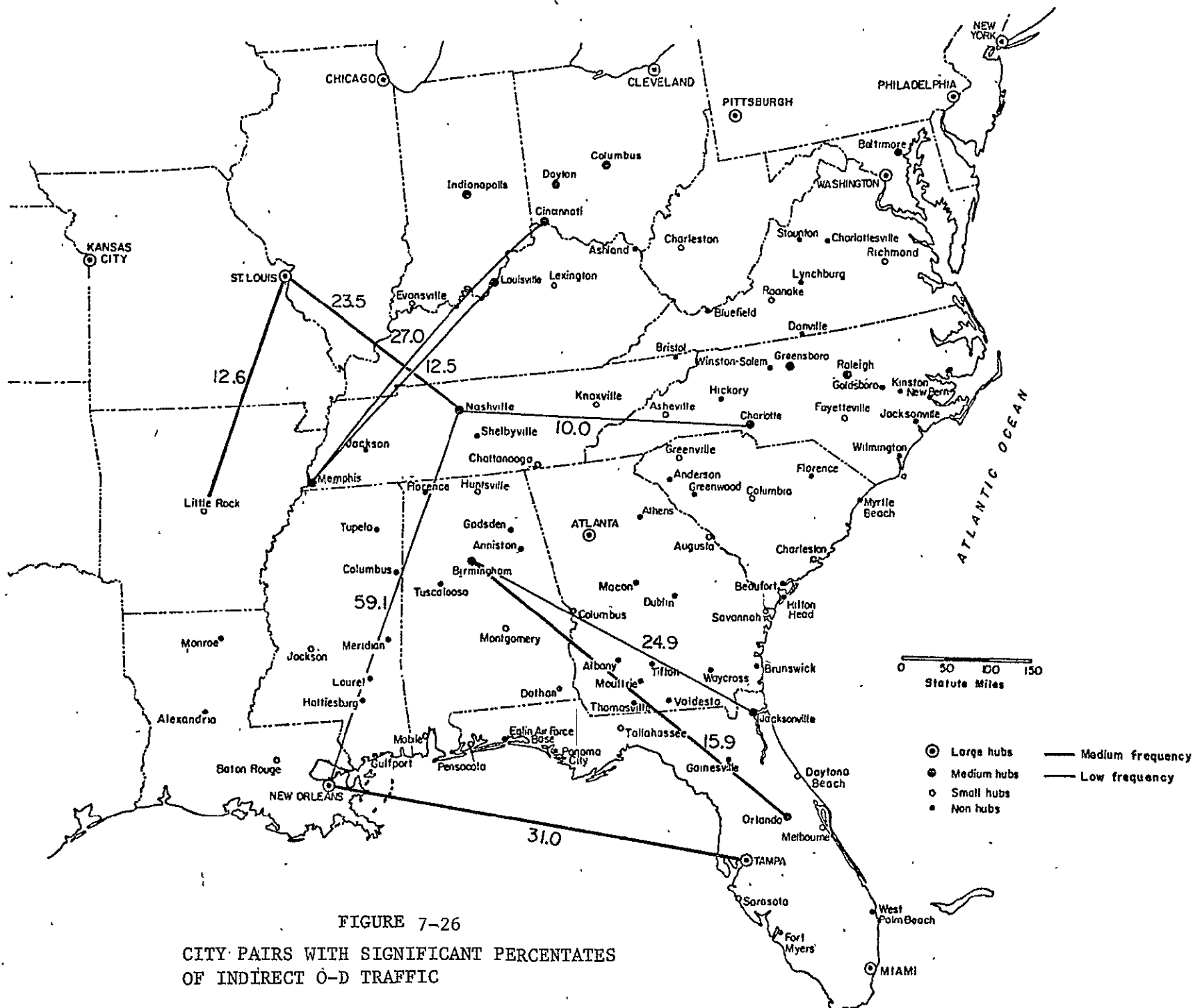


FIGURE 7-26  
CITY PAIRS WITH SIGNIFICANT PERCENTAGES  
OF INDIRECT O-D TRAFFIC

can be drawn that no capacity constraints exist to significantly hinder the development of travel demand in the study region. Needless to say, further analysis of these patterns is in order before any firm conclusion can be made.

## 8. SUMMARY AND CONCLUSIONS

### Study Summary

This study is concerned with the short haul air transportation system in the southeastern United States with emphasis on Atlanta, the major hub in that region. The study is ultimately aimed at technology assessment related to short haul aircraft requirements and characteristics. It is performed in stages, of which this report covers the second. The first stage was concerned with the identification of data sources in the United States that cover short haul air transportation. This stage is concerned with investigating the study region's short haul air transportation system using the sources identified earlier, in an effort to identify the various aspects that need to be analyzed in order to contribute to the technology assessment mentioned above.

The basic approach of this stage of the study is to characterize travel demand patterns within the region, with emphasis on Atlanta, and to compare them with similarly characterized supply patterns. The aim of this type of comparison is to trace the causal relationships that result in the structure of the short haul transportation system and the nature of its operation, and to develop an understanding of these phenomena.

Initially, short haul air transportation is defined for the purpose of the study as air transportation on links shorter than 500 miles. However, as described later on in this chapter, it is found directly that such a strictly physical definition may not be adequate and other means of defining short haul air transportation are sought. None the less, the study region is defined by the area included in a circle of 500 miles radius centered on Atlanta.

A number of specific analyses are included in this study: 1) origin des-

tinuation trip patterns between Atlanta and 72 cities in the region are compiled for 1974 and analyzed. These patterns are then compared to the patterns of the air transportation service joining Atlanta with these cities. 2) The patterns of total traffic including origin destination traffic and connecting traffic on the links joining Atlanta with the region's cities are analyzed in the same manner as the first group. Comparisons are made with available service capacity and a *local utilization ratio* is compared for the various sectors of the region. The ratio is defined by dividing total traffic by total available seats on each connection. The term *local* is used because through traffic is not included in the calculation. 3) Some through traffic patterns are analyzed to assess the impact of not including that category in the rest of the analyses. Through traffic proportions are found to be normally quite low and are not given much attention in the rest of the work. 4) The patterns of connecting traffic at Atlanta airport is studied. Short haul and long haul connections are compared for all cities of the region in an attempt to quantify the importance of Atlanta as a major hub for the short haul system of the study area. 5) The traffic and service patterns between the cities of the region themselves are then analyzed and compared in an effort to understand the structure of the short haul network in the region. 6) A brief look is taken at the socioeconomic characteristics of Atlanta and the study region, and attempts are made to relate Atlanta origin destination patterns with some of the socioeconomic characteristics of the cities concerned. Finally, 7) a brief look is taken at the Atlanta airport location with respect to the rest of the metropolitan environment, and at the access system serving it. A brief assessment is made of earlier studies concerning the feasibility of various locations for a potential second airport at Atlanta.

### Major Findings of the Study

This stage of the study is basically exploratory and descriptive in nature. It is not intended to draw major conclusions about the nature of short haul air transportation or about the system in the study area. Its main purpose, as mentioned earlier, is to prepare background information for performing the various analyses required for technology assessment. Nevertheless, some observations of the data compiled for the purpose of the study are made and some interpretations and preliminary conclusions are made. These are presented in this section with the qualification that some of them are indeed quite preliminary and may change after further analysis of the phenomena involved.

Of approximately 10 million short haul passengers at Atlanta Airport in 1974, close to 69% made connections to other flights. About one third of these (or 2.2 million) were connecting to other short haul flights, and the rest were connecting to long haul flights. In addition, 31% of the total short haul traffic was either originating or terminating in Atlanta. This means that close to 5 million passengers in 1974 were potential users of a dedicated short haul system centered on Atlanta, in the sense that they did not need the interface with the long haul network out of that airport.

Travel demands between Atlanta and the cities in the region exhibit characteristically strong correlations with city size but seem to be independent of distance. The supply system serving these demands appears to be sufficient so that traffic volumes are not inhibited by lack of capacity or service frequency. Local utilization ratios for the air services connecting the short haul cities with Atlanta are generally low. Indeed, the local utilization ratios for total traffic, i.e., origin destination plus connecting traffic, are also

low indicating that adequate, if not excess, capacity does exist on most links serving Atlanta and its short haul region.

A distinct pattern that appears when looking at the variations of traffic volumes is that a small number of hubs account for the larger portion of the total traffic, and a large number of smaller hubs generate low traffic movements. This pattern has strong implications on the design of a short haul transportation network, for it is quite important to distinguish between high density and low density short haul routes, a distinction that is very germane to aircraft technology assessment.

The structure of the network serving the traffic between the short haul cities of the region themselves appear to be strongly differentiated geographically. In general there appears to be adequate connectivity to serve most of the intercity travel demands, although for most of the smaller cities, and even for some of the larger ones, routings often occur via Atlanta. The most salient features of the geographic differentiation of the short haul air transportation system in the study area can be summarized as follows:

There existed in 1974 a pattern of low frequency service between small and non-hubs in the Northeast, and to a lesser extent, in the Southwest. High and medium frequency service appears to be concentrated in the Northwest and South. The study region also appears to be traversed by a high density corridor going from South to the Northwest connecting cities inside as well as outside the region with the large hubs in the Northwest, such as Chicago. Most of these features are a result of the location of the cities, large and small in the study area and immediately around it. Some of these locational patterns are:

- a. The Northeast is dominated by a number of large hubs just outside the region, e.g., Pittsburgh, Washington;



- b. The Southeast is dominated by Tampa inside the region and Miami just outside it;
- c. There are no major cities to the east and south of the region;
- d. The Southwest is dominated by New Orleans; and
- e. The Northwest is dominated by St. Louis inside the region, and Chicago outside it.

It appears as though a good way to proceed with the study of the short haul system in the region, is to look at it on the basis of geographic sectors although, naturally, without ignoring the possibly strong interaction between these sectors.

Some analysis of service patterns provided by individual carrier is carried out. It shows that in the Northeast and Southwest networks are characterized by high connectivity but with lower frequencies. The Northeast is served by Piedmont Airlines which provides what seems to be shuttling service between Washington and Atlanta with stops in the region. Southern provides a similar service connecting New Orleans and Atlanta with stops in that sector of the region.

#### Some General Conclusions and Plans for Further Work

On the Definition of Short Haul Air Transportation: It appears that while the 500-miles delineation of a study region is useful for the study of short haul air transportation in the Southeastern United States, the definition of short haul air transportation cannot be adequately made solely on the basis of such a delineation. The pattern observed in this study area, and which is likely to appear in other regions is actually associated with long haul flights connect-

ing cities outside the region with its major hub, Atlanta. Some sectors, particularly the Northeasterly, are served by a dense network of short haul flights albeit with lower service frequencies. These flights have lengths of haul smaller than 500 miles. Also, for the "short haul" connections between Atlanta and the rest of the region, the average length of haul is 284 miles. The implications of length of haul requirements of a short haul aircraft cannot be overemphasized.

Furthermore, considerable interaction occurs between cities within the region and large cities just outside it. Consequently a region delineated on the basis of distance from one major hub as is the case in this study, may not be adequate. It appears as if a more detailed study of a *smaller* area than the one used so far, with a detailed look at the network structure and demand patterns would be appropriate. It would also appear that a final and complete definition of short haul air transportation depends on the purpose for which such a definition is needed. For technology assessment such a definition becomes a part of the findings of a detailed study, and of the specifications for aircraft requirements.

On the Implications for a Dedicated Short Haul System: A dedicated short haul air transportation system is one that serves a market, however defined, in which all the flights are of short length of haul. The viability of such a system has strong implications on the feasibility of short haul aircraft technology, and vice versa. The dedicated short haul system would have three distinguishing features. They are 1) short haul aircraft; 2) dedicated service network; and 3) one or more short haul airports. These three are interconnected. For example, the structure of the network will affect average trip length and hence aircraft technology requirements, just as it will affect link volumes,

and hence aircraft size requirements. The connections pattern will affect aircraft ground handling characteristics, and it will have implications for airport requirements.

It is believed that considerable headway toward short haul aircraft technology assessment may be achieved by looking at such a system and studying in detail all its features and implications. This would include the optimal network structure and flight scheduling; demand analysis for traffic forecasting; airport requirements for economic and environmental feasibility analysis. These topics are the subjects of further work using as a background, the data collected for the Atlanta region.

## APPENDIX I

## GROUND ACCESS AT ATLANTA

About 3.0 million passengers, 30% of the total short haul passengers enplaning and deplaning at Atlanta, are actually originating or terminating their journey there. For these passengers the accessibility of the airport to their ground origins or destinations is very significant. When ground access time is compared to flying time it is more significant for short haul flights than for long haul flights. It is reasonable to conclude that the distance of the airport from the ground origins and destinations of passengers will have more impact on the mode split of short haul journeys than that of long haul journeys.

The most recent study, involving, a survey of ground origins and destinations of passengers at Atlanta, was done by Voorhees and Associates in 1968 (Atlanta Airport Transportation Studies). The results of their survey are presented in Figure I-1. As can be seen, 87% of originating and terminating passengers in the sample were found to have ground origins and destinations within a region centered on the CBD. This region, covering parts of Fulton and DeKalb counties, is defined by Voorhees as districts 1-58. This survey applied to all passengers, that is it did not differentiate between long haul and short haul passengers. Note that Atlanta International Airport is situated on the southern edge of the region. Any new airport at Atlanta would most certainly be farther from this region than the existing International Airport.

While this survey is now 9 years old, and does not necessarily represent the present situation, it is likely that a major proportion of ground origins and destinations are still located in districts 1-58. The socio-economic

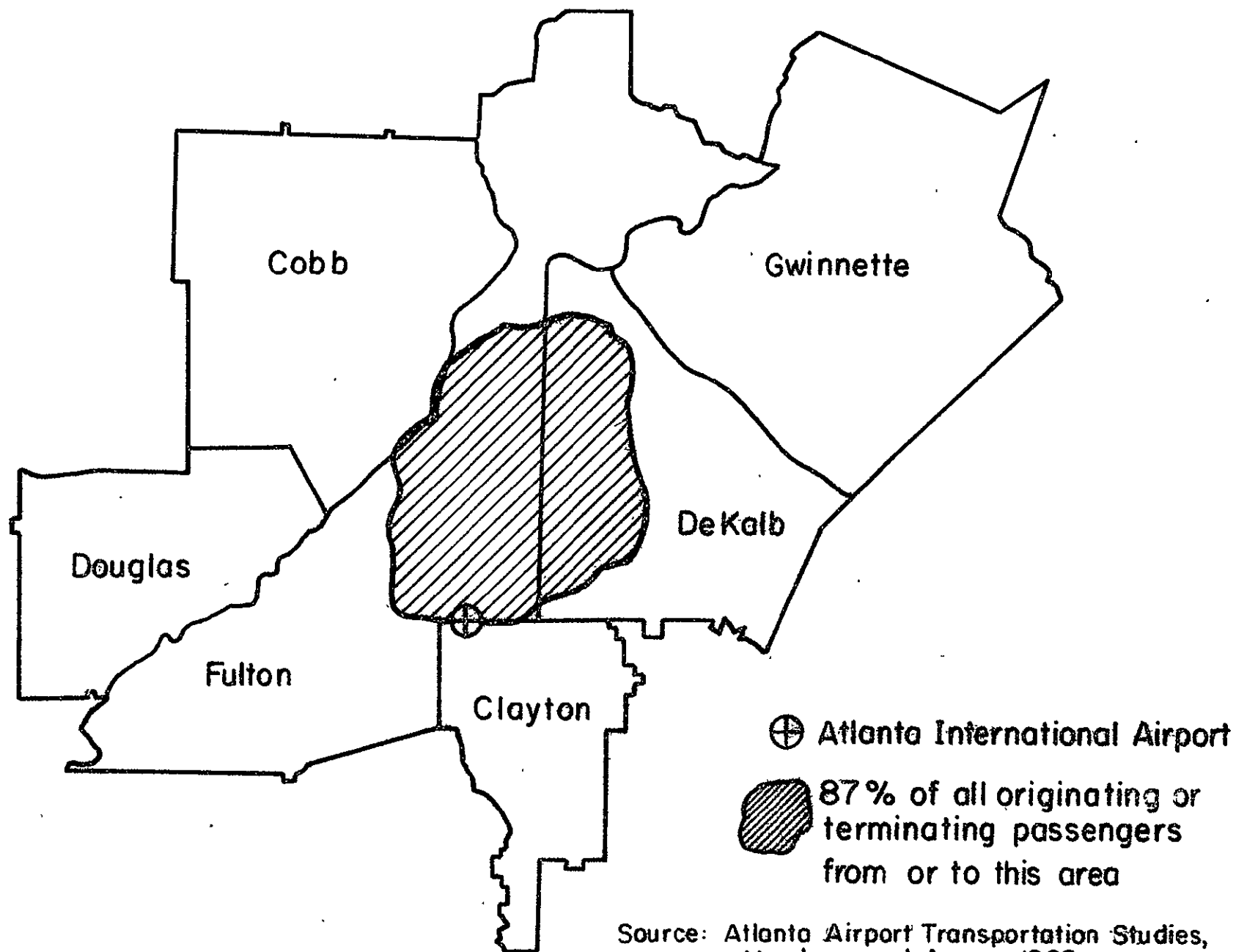


FIG. I-1 GROUND ORIGINS AND DESTINATIONS OF PASSENGERS AT ATLANTA INT. AIRPORT

profile presented in Section 3 of this report shows that 65.5% of the population of the Atlanta Regional Commissions Planning Area live in Fulton and De-Klab counties. However, if there is to be any separation of long haul and short haul air passenger activity, it is important to investigate their separate ground origin/destination patterns at Atlanta.

The need for a second air carrier airport at Atlanta has been studied extensively by the Atlanta Regional Commission. Their report, Atlanta Regional System Plan (1975), presents an unrestrained enplanement forecast of 68 million passengers by the year 2000 (compared to 12.6 million passengers enplaned in 1974). Total certificated air carrier operations are forecast to grow to 580,000 in 1978 and 1.9 million by the year 2000. In addition, general aviation activity at Atlanta is forecast to grow to 50,000 annual operations in 1978 and to 200,000 by the year 2000. The significance of general aviation activity at Atlanta has led the ARC to include plans for the development of new general aviation airports in their Airport System Plan. The development of general aviation at other airports is seen as a means for relieving congestion at Atlanta International Airport. A special study of General Aviation needs at Atlanta was made by Peat, Marwick and Mitchell in 1973 (General Aviation Requirements Study prepared for City of Atlanta).

After evaluating eight search areas for a new air carrier airport at Atlanta, the Atlanta Regional Commission chose the NW and SE search areas for further study. Their 1974 report, Ground Access Evaluation for the Atlanta Airport Systems Plan, investigate these two search areas. Person hours of travel and average travel time were compared for three alternative scenarios: (1) Atlanta International Airport alone, (2) Atlanta International Airport plus new airport in the NW, (3) Atlanta International Airport plus

new airport in the SE. The report concludes that the expansion of Atlanta International Airport alone would be the most desirable alternative, but points out that severe access congestion would occur in hours of peak demand on all routes serving the airport. The second best alternative, in terms of access travel time, was found to be Atlanta International Airport plus a new airport in the NW. This is compatible with population statistics which indicate higher growth rates in the northwest and the northward migration of offices in the city. While Atlanta International Airport would still encounter substantial access problems, highway access to a new airport in the NW was predicted to be adequate through 1993. The Atlanta Regional Commission selected the NW search area, air carrier alternative, with a compatible general aviation system, as a basis for further study.

A study is presently being undertaken by ORI (Operations Research Incorporated) under the sponsorship of the Department of Transportation, Federal Aviation Administration. Their work involves the evaluation of airport demand under various scenarios including the separation of long haul and short haul air traffic activities.

As noted earlier, the ARC studies for their Airport Systems plan were based on forecasts of unrestrained growth in passenger enplanements. This includes the growth of connecting passengers as well as originating and terminating passengers. An alternative approach would be to pursue a program of planned or directed growth, particularly with respect to connecting passenger activities at Atlanta. The scheduled air carrier network in the Atlanta region should be planned to provide the most optimal pattern of service for passengers as well as the most optimal use of existing airport facilities. If O-D traffic is unnecessarily routed through Atlanta, a burden

is being placed on that airport which need not be. When air passenger travel between other hubs is low in volume, routing through a major hub may be necessary. However, air passenger growth is considerable and when the traffic volume is high enough direct service between these smaller hubs can be provided. The fact that provision of direct service between other hubs would also have the effect of generating more air travel between them should not be overlooked. If growth in the region is such that some connecting traffic can be diverted by provision of direct service total enplanements at Atlanta may not grow as forecast.

However, airport access is concerned with originating and terminating passengers at Atlanta and diversion of connecting traffic will not relieve ground access problems at Atlanta. If a second air carrier airport at Atlanta was to be a dedicated short haul airport, this would affect the choice of a location since ground access time is more significant for short haul travel. The development of an optimal pattern of scheduled air service in the region (short haul or otherwise), on the basis of passenger movements, would provide information helpful to airport planners. A survey of trip purpose and ground origins and destinations for short haul travel should be undertaken for a clearer understanding of the requirements of such a short haul system.



APPENDIX II  
THROUGH PASSENGERS

Data for through passengers at any hub are available from the Civil Aeronautics Board Service Segment Data Base. At the beginning of 1977 restrictions on access to these data were lifted and they are now available to users as soon as they are assembled and stored on tape at the National Archives. Data for every flight segment of every certificated domestic carrier flight are stored on a monthly basis. The data are not aggregated into an annual total. Printed output of this data, suitable only when a small amount of data are required, is available from the National Archives, as also are specialized extracts on magnetic tape or copies of the complete tapes.

For study of air networks it is necessary to access data for a specific city or city pair. Because of the manner in which service segment data are stored, this requires a computer search of each month's data for the flight segments involving the specified cities or city pairs. The numbers of through passengers at specific cities can be assembled as the search proceeds. The cost of undertaking this on a region-wide basis for 1974 precluded its undertaking for this study. Nevertheless, service segment data is recognized as a very useful data source particularly for a detailed study of specific parts of the region. I.P. Sharp Associates are currently in the process of investigating the potential for making this data available through their services in the same manner that CAB-origin destination data is now available. If this does not materialize,

further investigation of service segment data could be embarked upon by purchasing of a tape of one month's data for preliminary study and development of search routines for accessing data in various ways.

A detailed study of Service Segment Data of a typical day in August, 1973 and for the top 100 U.S. airports has been undertaken by the Air Transportation Association (ATA) and is included in their report "Aircraft Movement and Passenger Data" (AMPD). Table II-1 shows data for Atlanta extracted from AMPD. The percentages of through traffic at Atlanta can be considered representative of through passengers activity in 1974. It can be seen that through passengers at Atlanta for traffic with specific cities, varies from 0% to 17% of total traffic.

Through passengers percentages at Atlanta on routes with Florida are high, reflecting the major traffic flows between Florida and the northwest. Through passengers at Atlanta are in a sense similar to connecting passengers in that they go to Atlanta only because the airline schedules take them there. Through passengers will be continuing on or coming from both long haul and short haul flight segments. The feasibility of obtaining data for these separately could only be determined from close examination of a service segment data tape.

TABLE II-1

## ANALYSIS OF 1973 THRU PASSENGERS AT ATLANTA

| CITY                  | PASSENGERS INTO<br>AND OUT OF ATLANTA |       | THRU PASS.<br>AS % OF<br>TOTAL |
|-----------------------|---------------------------------------|-------|--------------------------------|
|                       | THRU                                  | TOTAL |                                |
| Albany, Ga.           | 0                                     | 378   | 0%                             |
| Anderson, S.C.        | 0                                     | 0     | --                             |
| Anniston, Ala.        | 0                                     | 176   | 0                              |
| Asheville, N.C.       | 4                                     | 757   | 0.5                            |
| Athens, Ga.           | 0                                     | 104   | 0                              |
| Augusta, Ga.          | 36                                    | 1094  | 3.3                            |
| Baton Rouge, La.      | 16                                    | 229   | 7.0                            |
| Birmingham, Ala.      | 219                                   | 2173  | 10.1                           |
| Charleston, S.C.      | 13                                    | 427   | 3.0                            |
| Charleston, W.Va.     | 11                                    | 227   | 4.8                            |
| Charlotte, N.C.       | 122                                   | 1516  | 8.0                            |
| Chattanooga, Tenn.    | 36                                    | 1033  | 3.5                            |
| Cincinnati, O         | 101                                   | 885   | 11.4                           |
| Columbia, S.C.        | 70                                    | 1580  | 4.4                            |
| Columbus, Ga.         | 34                                    | 992   | 3.4                            |
| Columbus, O           | 41                                    | 397   | 10.3                           |
| Dayton, O             | 80                                    | 899   | 8.9                            |
| Daytona Beach, Fla.   | 81                                    | 769   | 10.5                           |
| Dothan, Ala.          | 0                                     | 311   | 0                              |
| Eglin A.F. Base, Fla. | 12                                    | 185   | 6.5                            |
| Evansville, Ind.      | 3                                     | 137   | 2.2                            |
| Fayetteville, N.C.    | 0                                     | 388   | 0                              |
| Florence, S.C.        | 0                                     | 209   | 0                              |
| Gadsden, Ala.         | 0                                     | 79    | 0                              |
| Gainesville, Fla.     | 13                                    | 300   | 4.3                            |
| Greensboro, N.C.      | 75                                    | 758   | 9.9                            |
| Greenville, S.C.      | 20                                    | 558   | 3.6                            |
| Greenwood, S.C.       | 0                                     | 0     | --                             |
| Gulfport, Miss.       | 0                                     | 4     | 0                              |
| Huntsville, Ala.      | 0                                     | 508   | 0                              |
| Indianapolis, Ind.    | 95                                    | 812   | 11.7                           |
| Jackson, Miss.        | 76                                    | 631   | 12.0                           |
| Jacksonville, Fla.    | 187                                   | 2418  | 7.7                            |

*Data taken from "Aircraft Movement and Passenger Data," Air Transport of America, 1973. Passenger numbers are for an average day in August.*

TABLE II-1  
(cont.)

| CITY                  | PASSENGERS INTO<br>AND OUT OF ATLANTA |       | THRU PASS.<br>AS % OF<br>TOTAL |
|-----------------------|---------------------------------------|-------|--------------------------------|
|                       | THRU                                  | TOTAL |                                |
| Jacksonville, N.C.    | 0                                     | 28    | 0 %                            |
| Kinston, N.C.         | 0                                     | 1     | 0                              |
| Knoxville, Tenn.      | 36                                    | 770   | 4.7                            |
| Lexington, Ky.        | 7                                     | 144   | 4.9                            |
| Louisville, Ky.       | 131                                   | 1180  | 11.1                           |
| Macon, Ga.            | 16                                    | 560   | 2.9                            |
| Melborne, Fla.        | 37                                    | 533   | 6.9                            |
| Memphis, Tenn.        | 90                                    | 1417  | 6.4                            |
| Meridan, Miss.        | 0                                     | 137   | 0                              |
| Mobile, Ala.          | 15                                    | 592   | 2.5                            |
| Montgomery, Ala.      | 76                                    | 982   | 7.7                            |
| Moultrie, Fla.        | 0                                     | 100   | 0                              |
| Muscle Shoals, Va.    | 0                                     | 16    | 0                              |
| Myrtle Beach, S.C.    | 0                                     | 159   | 0                              |
| Nashville, Tenn.      | 32                                    | 798   | 4.0                            |
| New Orleans, La.      | 258                                   | 1858  | 13.9                           |
| Orlando, Fla.         | 320                                   | 2502  | 12.8                           |
| Panama City, Fla.     | 0                                     | 188   | 0                              |
| Pensacola, Fla.       | 34                                    | 758   | 4.5                            |
| Raleigh, N.C.         | 57                                    | 907   | 6.3                            |
| Richmond, Va.         | 24                                    | 568   | 4.2                            |
| Roanoke, Va.          | 0                                     | 113   | 0                              |
| St. Louis, Mo.        | 44                                    | 1211  | 3.6                            |
| Sarasota, Fla.        | 83                                    | 608   | 13.7                           |
| Savannah, Ga.         | 32                                    | 966   | 3.3                            |
| Tampa, Fla.           | 477                                   | 2874  | 16.6                           |
| Titusville, Fla.      | 0                                     | 197   | 0                              |
| Tri-City Airp., Tenn. | 0                                     | 489   | 0                              |
| Valdosta, Ga.         | 0                                     | 2     | 0                              |
| Wilmington, N.C.      | 0                                     | 265   | 0                              |
| Winston-Salem, N.C.   | 0                                     | 50    | 0                              |
| GRAND TOTAL           | 3114                                  | 41907 | 7.4%                           |

## APPENDIX III

## TRAFFIC DATA ACCESSING FROM I.P. SHARP SYSTEM

On a continuous basis, the CAB collects 10% sample of detailed itineraries from passenger tickets in the U.S. The data of this survey pertaining to domestic carriers, is available to users through a commercial company, namely I.P. Sharp Associates. The Sharp O-D data base, which is constructed from CAB Data Bank 2C, has been structured to allow instant access to both O-D and connecting traffic (each stored in separate sets of components) with respect to any given city pair. The data access requires understanding of APL, a specific computer language, and of data structure in the Sharp system.

In the Sharp System, the itinerary data is stored in matrix form. For a given city pair, identified by their city codes, the matrix records passenger itineraries. At present, the data is available on a quarterly basis for three years from 1973 to 1975. The first 12 columns store the numbers of domestic passengers and the next 12 columns, the numbers of international passengers for each quarter. The remaining columns give the itinerary information in the following format -- city, carrier, distance, city, carrier, distance, etc. Because the storage space per component is 10000 bytes, the itinerary data of a given city pair sometimes occupies more than one component in the data base.

C-3

Before accessing the itinerary data, the user has to know the component number in which the data of interest is stored. First, the user has to sign on to the Sharp System and then, load a workspace called JUSTQAND which specifically deals with CAB O-D data. By using the system function ODPTRL (for O-D traffic accessing) and/or ODPTRB (for connecting traffic accessing), the user can find the number of the first component in which the data is stored and the number of components used to store the itinerary data of the given city pair.

The last component of any city pair data is the summary vector which summarizes the information stored previously including: numerical codes of cities, total number of itineraries in CAB O-D Survey; total number of passengers for each quarter, domestic and international respectively; and the size of each component.

While a set of standard analytical reports is provided for users by the Sharp System, they do not serve the purpose of this study. Specific computer programs were written during the course of this study to find the behavior of connectivities between two cities. With some knowledge of APL and of data structure of Sharp System, programs for any special interest can be easily constructed.

#### Data Accuracy

In order to reduce O-D traffic analysis to a practical level, Sharp System stores itinerary information based on three criteria. An itinerary is retained if:

- (a) it contained 5 or fewer coupons (segments) and
- (b) there were 5 or more passengers who followed the itinerary over any 4 quarter period.
- (c) Any itinerary not meeting the above criteria is placed under "miscellaneous" for the city pair involved, and can be obtained from the summary vector of a given city pair.

It was found that, for a given city pair, the retained data of connecting traffic covers all itineraries of the CAB O-D Survey. However, the retained data of O-D traffic does not equal the figure shown in CAB published form. The main reason why these differences occur in O-D traffic is that there are some O-D itineraries violating criteria (b). It is expected that as the distance between two cities increases, the opportunity for intermediate connecting points increases for indirect O-D passengers. An interesting example is that there are 175 different itineraries in the CAB Survey for O-D passengers from Tampa, FL to Atlanta, GA, but the number of retained itineraries in the Sharp System is 28.

Because this difference was found in O-D traffic, comparison of O-D data from I.P. Sharp and from CAB is made, and the results are shown in Table III-1. It is clear that the error of Sharp data increases with the distance, however, the percentage error is considerably small for most cases and it is believed that the O-D traffic data used in Section 5 and 6 is accurate enough for the analysis of this report.

Data for commuter carriers are not available through I.P. Sharp and are not included in Table III-1.

TABLE III-1  
I.P. SHARP DATA ACCURACY FOR O-D TRAFFIC WITH ATLANTA<sup>1</sup>

| City              | Distance<br>to<br>Atlanta<br>(miles) | Data From<br>CAB Published<br>Form | Data From<br>I.P. Sharp | ERROR                                     |                   |
|-------------------|--------------------------------------|------------------------------------|-------------------------|-------------------------------------------|-------------------|
|                   |                                      |                                    |                         | Difference<br>Between<br>CAB & I.P. Sharp | % of CAB<br>Data  |
| Macon, GA         | 79                                   | 7,270                              | 7,230                   | 40                                        | 0.5               |
| Columbus, GA      | 83                                   | 18,760                             | 18,750                  | 10                                        | 0.05              |
| Chattanooga, TN   | 106                                  | 17,440                             | 17,380                  | 60                                        | 0.3               |
| Birmingham, AL    | 134                                  | 103,290                            | 103,180                 | 110                                       | 0.1               |
| Augusta, GA       | 143                                  | 26,920                             | 26,700                  | 220                                       | 0.8               |
| Albany, GA        | 146                                  | 20,880                             | 20,800                  | 80                                        | 0.3               |
| Montgomery, AL    | 147                                  | 34,170                             | 33,990                  | 180                                       | 0.5               |
| Huntsville, AL    | 151                                  | 33,130                             | 32,950                  | 180                                       | 0.5               |
| Knoxville, TN     | 152                                  | 54,930                             | 54,520                  | 410                                       | 0.7               |
| Greenville, SC    | 154                                  | 27,120                             | 26,730                  | 390                                       | 1.4               |
| Asheville, NC     | 164                                  | 21,490                             | 21,240                  | 250                                       | 1.1               |
| Dothan, AL        | 171                                  | 16,240                             | 16,130                  | 110                                       | 0.6               |
| Tuscaloosa, AL    | 186                                  | 9,770                              | 9,710                   | 60                                        | 0.6               |
| Columbia, SC      | 192                                  | 72,640                             | 72,290                  | 350                                       | 0.4               |
| Muscle Shoals, AL | 198                                  | 6,950                              | 1,750                   | 5,200 <sup>2</sup>                        | 74.8 <sup>2</sup> |
| Valdosta, GA      | 208                                  | 7,000                              | 6,890                   | 110                                       | 1.5               |
| Nashville, TN     | 214                                  | 99,790                             | 98,970                  | 820                                       | 0.8               |
| Savannah, GA      | 215                                  | 92,750                             | 92,430                  | 320                                       | 0.3               |
| Tallahassee, FL   | 223                                  | 38,610                             | 38,250                  | 360                                       | 0.9               |
| Hickory, NC       | 225                                  | 5,800                              | 5,740                   | 60                                        | 1.0               |
| Bristol, TN       | 227                                  | 29,740                             | 29,180                  | 560                                       | 1.8               |
| Charlotte, NC     | 227                                  | 128,920                            | 127,630                 | 1,290                                     | 1.0               |
| Columbus, MS      | 241                                  | 7,430                              | 7,270                   | 160                                       | 2.1               |
| Panama City, FL   | 247                                  | 18,500                             | 18,310                  | 190                                       | 1.0               |
| Jacksonville, FL  | 247                                  | 148,650                            | 147,540                 | 1,110                                     | 0.7               |
| Eglin A.F.B., FL  | 250                                  | 16,050                             | 15,860                  | 190                                       | 1.1               |
| Charleston, SC    | 259                                  | 51,230                             | 50,690                  | 540                                       | 1.0               |
| Meridan, MS       | 267                                  | 7,540                              | 7,420                   | 120                                       | 1.5               |
| Pensacola, FL     | 272                                  | 35,990                             | 35,550                  | 440                                       | 1.2               |
| Florence, SC      | 273                                  | 9,770                              | 9,590                   | 180                                       | 1.8               |
| Winston Salem, NC | 294                                  | 12,610                             | 12,310                  | 300                                       | 2.3               |
| Gainesville, FL   | 300                                  | 18,280                             | 17,970                  | 310                                       | 1.7               |
| Mobile, AL        | 302                                  | 49,760                             | 49,040                  | 720                                       | 1.4               |
| Lexington, KY     | 303                                  | 28,660                             | 28,170                  | 490                                       | 1.7               |
| Greensboro, NC    | 306                                  | 71,440                             | 70,480                  | 960                                       | 1.3               |
| Louisville, KY    | 321                                  | 75,920                             | 74,440                  | 1,480                                     | 1.9               |
| Myrtle Beach, SC  | 329                                  | 9,410                              | 9,290                   | 120                                       | 1.2               |
| Fayetteville, NC  | 330                                  | 24,850                             | 24,550                  | 300                                       | 1.2               |
| Memphis, TN       | 332                                  | 133,180                            | 129,940                 | 3,240                                     | 2.4               |
| Jackson, MS       | 341                                  | 62,220                             | 61,200                  | 1,020                                     | 1.6               |
| Ashland, KY       | 342                                  | 4,370                              | 4,070                   | 300                                       | 6.8               |
| Evansville, IN    | 350                                  | 10,930                             | 10,490                  | 440                                       | 4.0               |



TABLE III-1 (continued)

| City                | Distance<br>to<br>Atlanta<br>(miles) | Data From<br>CAB Published<br>Form | Data From<br>I.P.Sharp | ERROR                                     |                  |
|---------------------|--------------------------------------|------------------------------------|------------------------|-------------------------------------------|------------------|
|                     |                                      |                                    |                        | Difference<br>Between CAB<br>& I.P. Sharp | % of CAB<br>Data |
| Gulfport, MS        | 352                                  | 11,760                             | 11,390                 | 370                                       | 3.1              |
| Raleigh, NC         | 356                                  | 94,010                             | 92,230                 | 1,780                                     | 1.9              |
| Roanoke, VA         | 357                                  | 27,660                             | 26,500                 | 1,160                                     | 4.2              |
| Charleston, WV      | 363                                  | 17,520                             | 16,900                 | 620                                       | 3.5              |
| Daytona Bch., FL    | 366                                  | 35,220                             | 35,020                 | 200                                       | 0.5              |
| Cincinnati, OH      | 373                                  | 59,050                             | 56,890                 | 2,160                                     | 3.6              |
| Wilmington, NC      | 377                                  | 16,200                             | 15,620                 | 580                                       | 3.5              |
| Lynchburg, VA       | 389                                  | 6,200                              | 5,850                  | 350                                       | 5.6              |
| Orlando, FL         | 400                                  | 139,150                            | 136,950                | 2,200                                     | 1.6              |
| Kinston, NC         | 406                                  | 8,950                              | 8,730                  | 230                                       | 2.4              |
| Jacksonville, NC    | 407                                  | 5,170                              | 4,940                  | 230                                       | 4.4              |
| Tampa, FL           | 412                                  | 194,270                            | 190,600                | 3,670                                     | 1.9              |
| New Orleans, LA     | 425                                  | 121,560                            | 118,500                | 3,060                                     | 2.5              |
| Dayton, OH          | 432                                  | 40,550                             | 38,800                 | 1,750                                     | 4.3              |
| Indianapolis, IN    | 432                                  | 55,740                             | 53,730                 | 2,010                                     | 3.6              |
| New Bern, NC        | 433                                  | 4,030                              | 3,860                  | 170                                       | 4.2              |
| Melbourne, FL       | 443                                  | 18,340                             | 18,070                 | 270                                       | 1.4              |
| Sarasota, FL        | 444                                  | 28,410                             | 27,720                 | 690                                       | 2.4              |
| Columbus, OH        | 446                                  | 50,650                             | 48,000                 | 2,650                                     | 5.2              |
| Monroe, LA          | 448                                  | 8,270                              | 7,820                  | 450                                       | 5.4              |
| Baton Rouge, LA     | 449                                  | 18,840                             | 18,060                 | 780                                       | 4.1              |
| Little Rock, AR     | 453                                  | 23,360                             | 21,700                 | 1,760                                     | 7.1              |
| Charlottesville, VA | 457                                  | 5,350                              | 5,090                  | 240                                       | 4.8              |
| Richmond, VA        | 481                                  | 59,420                             | 57,570                 | 1,850                                     | 3.1              |
| St. Louis, MO       | 484                                  | 78,030                             | 74,030                 | 4,000                                     | 5.1              |
| Alexandria, LA      | 485                                  | 6,850                              | 6,500                  | 350                                       | 5.1              |

## NOTE:

- (1) Cities with commuter carriers are not included.
- (2) This error is due to changing the airport code in 1974.